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EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANISATION

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Papers

read and discussed at the

INTERNATIONAL REFRESHER COURSE FOR PHYTOSANITARY INSPECTORS

(Munich, October 21-26, 1957)

January 1958
PARIS
142 avenue des Champs-Élysées

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FOR PHYTOSANITARY INSPECTORS

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FOREWORD

To meet a generally-expressed request, it has been decided to reproduce as a bound volume the papers read at the International Refresher Course for Phytosanitary Inspectors convened by EPPO at Munich, Federal Germany, on October 21 - 26, 1957. The question of adding to the volume a summary of the valuable discussions which followed the reading of the papers was also considered, but as many of the opinions expressed were personal, and not necessarily those of governments, it was felt to be inexpedient to place them on permanent record. It must also be stated that the views expressed on several matters of "policy" in the papers read are those of the authors of the papers and not necessarily those of EPPO.

142 avenue des Champs-Elysées,
PARIS VIII°.

January 1958.

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Dr.K.Böning, Munich. (Original language: GERMAN).

Munich is the most important of all the points of entry into the German Federal Republic of imported produce subject to phytosanitary inspection. Each year the volume of imported produce inspected is approximately the same as the volume of similar produce entering the Port of Hamburg. Munich and Hamburg together handle about half the total imports into the Federal Republic. Munich owes this exceptional position in the framework of official German phytosanitary inspection to the important trade, between the Federal German Republic and the southern and South-Eastern countries, in plant produce for consumption, and also to the fact that such produce arrives at several points on the Bavarian frontier where for technical reasons inspection is impossible. This centralisation has, however, proved advantageous from the phytosanitary standpoint, because it enables a well-equipped inspection station to be maintained, carrying out its task both in the technical and administrative fields.

Munich and Hamburg can also be compared in many respects in regard to the nature of the produce for inspection. In both places, it is mainly fruit which has to be inspected - in Munich fruit represents 90% of the total volume of inspected produce, the remaining 10% comprising potatoes, vegetables and cut flowers. The proportion of potatoes being lower in Hamburg, the percentage of ornamental plants, nursery stock and some other things is higher. The volume of importations inspected has steadily increased during the last few years; taking into account the other points of entry in Bavaria which depend on Munich but where activity is nevertheless negligible in relation to the total imports, the figures for the last 5 years are:

1952 - 275,000-tons; 1953 - 300,000-tons; 1954 - 286,000-tons; 1955 - 433,000-tons; 1956 - 495,000-tons.

The 1957 figure seems likely to reach that of 1956.

Apples are the most important of the imported fruits, representing about 50% of the total. Then follow grapes and certain citrus fruits for direct consumption, lemons, pears, peaches, plums, apricots and cherries.

Italy is the main source of supply, being the biggest supplier of fruit of all sorts except plums, and almost all imports of early potatoes come from that country also. Next in importance is Hungary for imports of apples, grapes, cherries and apricots, and she is our biggest supplier of plums. Yugoslavia comes third, and Greece is becoming increasingly important as an exporter of citrus, grapes and peaches. We also import from Austria, Czechoslovakia, Bulgaria, Rumania, Turkey and Egypt.

As it is mainly fruit which is imported, San José scale (Quadraspidiotus perniciosus Comst.) is the most important pest involved. It may be found on fruit of all kinds, except perhaps citrus, on which infestation has up to now never been observed. In order of importance, the fruit contaminated is: apples, pears and plums, sometimes also cherries, peaches and

 /apricots,

apricots, particularly when a portion of stalk remains, which is often infested. In other cases San José scale is found on the fruit in the stalk convexity. Grapes are also frequently infested, the fruit being less infested than the wood. The identification of San José scale requires a wide knowledge of all fruit tree scales giving similar signs of infestation. Also a layman might well take for San José scale spots of a non-parasitic nature, on apricots for example. All doubtful cases are subjected in Munich to very precise microscopic examination and the produce is only refused when the diagnosis is certain. Permanent specimens are prepared from all infested consignments and kept as test samples for any future verification. A register must be kept of all cases of infestation by other scales, for scientific purposes. All cases of San José scale - even if the degree of infestation is so slight that the consignment is not refused - are recorded with reference to the place of origin and loading, in order to gain an exact idea of the degree of infestation and the efficiency of control methods in the different producing countries. An overall view of the situation in different years is also shown by pin-pointing on the map. This statistical work may seem to those who are not used to these matters to be exaggerated or even superfluous, but it really does appreciably facilitate the work of inspection, and when colleagues say that it is impossible to find all cases of infestation by random sampling, I venture to affirm, although this may perhaps appear rather bold, that in spite of the inspection of a comparatively small proportion only of the produce and the inevitable speed of the work, almost never does any appreciable infestation pass unnoticed. We owe this result not only to the caution and experience of our experts, but also to our exact knowledge of the methods of working and the conditions in the producing countries, which we can study with the aid of all the precise information we have collected.

There are other fruit pests which are of importance to us besides San José scale. The cherry fruit fly (Rhagoletis cerasi), the Mediterranean fruit fly (Ceratitis capitata) for citrus, the Oriental fruit moth (Laspeyresia molesta) for peaches and apricots. These pests are comparatively simple to recognise. The cherry fruit fly is rather frequent towards the end of the season. We rarely refuse imports because of the Mediterranean fruit fly, because it can be sufficiently controlled in the countries with which we deal. Laspeyresia molesta is only occasionally observed.

A new pest for us, originating from the South-eastern countries, and subject to phytosanitary measures, is Hyphantria cunea, first found on grapes from Hungary. So far infestation has only been found on consignments at the end of the Autumn, infested by the last generation of the pest, generally in the form of caterpillars, or pupae developed during the journey. After passing the Winter in sheltered places some of the pupae become moths in the following Spring, so there is an undeniable danger of the pest becoming established in our country.

Potato pests are comparatively rarely observed in imports for consumption. Wart disease has not so far been observed. Eelworm cysts are sometimes found, which proves that the pest also exists in the Mediterranean area. Less important is the potato tuber moth, which is rarely found, and which does not seem to play an important rôle in the South.

/As

As regards our imports, the most important pest of cut flowers is carnation tortrix (Tortrix pronubana). It attacks not only carnations but also certain fruits. We sometimes find it on oranges, for example.

I will now say a few words on our conception of the value and importance of inspection of imports. I could over-simplify my task and say that thanks to strictly applied restrictions, the phytosanitary measures enable us to prevent the introduction of important pests and diseases; or, on the contrary, that since phytosanitary measures do not enable us to prevent with certainty the introduction of pests even for a short time, they are useless. A little reasoning disposes of the first statement, whilst practical experience, which has proved conclusive in many cases, opposes the second. This difference in conception depends on the way in which the problem is presented. No synthesis of these two contradictory points of view is therefore possible, because it would be more of a dialectical subtlety than a real solution, i.e. a proposition for the improvement of control within an infested country so that frontier inspection becomes less and less of a necessity - after all when one considers control, in the real sense of the term, to be useless, that goes both for control within a country and at the frontier. One should therefore be clear as to what is aimed at by inspection, not in general but in each individual case. Thus the object of phytosanitary measures will differ according to the behaviour and life cycle of the pest concerned, and there can be no generalisation of phytosanitary measures.

It seems to me that in a continent like Europe, made up of a number of small countries, it is necessary for phytosanitary purposes to make a distinction between two groups of pests - the first comprising the species which are comparatively immobile and more or less fixed to their host, and the second comprising species which move freely and are largely independent of their host. A typical species of the first group is San José scale. In that case intervention has a lasting effect. We know that so many secondary factors are necessary for the establishment of the pest, that this will only occur if introduction is massive and unchecked. We see the confirmation of this in the fact that we have so far succeeded in keeping Bavaria practically free of San José scale. Infestation of nursery stock from Würtemberg-Baden has been completely eliminated by internal intensive control, except for a centre of infestation in the Lower Main valley, the destruction of which is presenting difficulties. An importation of infested Italian nursery stock consigned from the Netherlands and having so-to-speak by-passed the regulations, was discovered in time thanks to inspection within the country, and was immediately eliminated. The pest has not been seen since, even between 1928 and 1940, years when imports from Hungary, although very heavily infested, gave rise to no infestation in Bavaria, thanks to routine inspections. To my mind this example is a proof of the effectiveness of the phytosanitary measures over an appreciable period of time. As representatives of the second group, I would mention the Colorado beetle or the Fall webworm. For these pests, phytosanitary measures can only delay infestation. Efforts can be made to keep such a pest at bay so long as it is not established near to the frontier. When the Colorado beetle reached the Franco-German frontier, it became

impossible to prevent its entry into Germany, but nevertheless the phytosanitary measures previously applied had not been useless - time had been gained which was used to study the best control measures to employ. Today, for us as for all countries of central Europe, phytosanitary measures against the Colorado beetle have become superfluous and can be abolished. It may perhaps be the same with the Fall Webworm, whose natural predators may possibly limit more quickly the extent of the infested zone. It can be assumed that the phytosanitary measures will continue to spare us from this pest.

The Mediterranean fruit-fly is an exception to the category of freely-moving pests. Our climatic conditions are not suitable for it, but it can do harm in areas with a mild climate, in less rigorous Winters. Here again phytosanitary measures can prevent massive spread - that is their aim.

The object of phytosanitary measures is not restricted to preserving a country from certain pests. In my view there exists no better way of knowing the incidence of a pest than routine inspection at the frontier. It is a way of ensuring that the producer takes steps to produce goods which are free from infestation. This pressure on the producer contributes, through the application of control measures, to the improvement of both quality and quantity and to the creation of competition, and moreover to reduce the danger to importing countries of the introduction of sources of infection. This very fact puts an obligation on the importing country to ensure by adequate control that its own internal conditions are good and the production equally healthy.

It is doubtful whether in the future, when in a united Europe the commercial and customs barriers cease to exist, phytosanitary inspection of imports can be dispensed with also. It is necessary now to give thought to a completely independent system of phytosanitary inspection in the future. Does it mean that the plant protection stations must take over the frontier institutions which hinder free trade in accordance with an unpleasant tradition which will then be out of date? I think that the maintenance of phytosanitary inspection will only be possible by the creation of a European phytosanitary authority on the lines of the already existing examples of international co-operation. In the last few years many countries have revised their phytosanitary regulations to meet the needs of the times - the Federal Republic has just done so. I personally see these examples as only the preliminaries to a European plant quarantine convention. The executive power would continue to belong to the countries or groups of countries with economic links, but their action would be directed by a higher independent authority issuing instructions and directives. Phytosanitary inspection stations would cease to be control posts serving especially national interests, and would become of an international character. Such a development of course requires time, and all the interested parties must first know where their common interest lies and how their national interest can be attuned to it. It is not too soon to think of the realisation of these projects and to study proposals on these lines, in order that they may from the start be in conformity with the provisions and plans of the creation of a common market for Europe.

I have reached the end of my talk and would ask you to excuse me for having gone beyond the immediate scope of my subject, but the phytosanitary problem could not be envisaged exclusively from a local standpoint - it is international in character.

II

Paper prepared by Plant Health Branch, Ministry of Agriculture, Fisheries and Food, London. (Original language: ENGLISH)
Read by Mr. R.Varley.

British organisation and legislation

1. In the short space of time at my disposal, I can do little more than warn you that, in the United Kingdom, although for practical purposes the same policy is pursued, there are three different national administrations - the Ministry of Agriculture, Fisheries and Food, in England and Wales (which handles by far the biggest proportion of imports), the Department of Agriculture for Scotland, and the Ministry of Agriculture in Northern Ireland. In the same short way, I have to remind you that the organisation of plant health work is quite different than that employed in most Western European countries. Instead of having one self-contained Service - ours tend to divide into three different parts under separate management - the Scientific Service, dealing with specialised problems concerning pests and diseases: the Inspectorate which deals with all the routine work of inspection; and the Administration which drafts legislation, and handles paper work and keeps a watching brief over the whole field.

2. In this short space of time, it is equally impossible to include a satisfactory historical outline of the plant health legislation in the United Kingdom, but suffice it to say here that the basis of our present plant health laws is constituted by (a) the Destructive Insects Act,1877 (passed to prevent the introduction or spread of the Colorado beetle), (b) an Act passed in 1907 to extend the Destructive Insects Act,1877, to "all pests destructive to crops, trees and bushes", and (c) an amending Act in 1927, to widen the existing powers, by empowering authorised officers to order the destruction or removal of infected crops. Under these Acts, a number of Orders have been made from time to time. These fall into two categories. The first, of great interest to you and to which I will return later, consists of Orders governing the importation of plants and plant products, and laying down in detail the various prohibitions, restrictions and conditions of entry. The second category comprises the domestic Orders designed to control the spread of the more important pests and diseases already in our country.

3. This legislation is under constant review. The Importation of Plants Order, 1955, is the latest consolidation of import regulations and it is hoped that these rules will be reviewed, revised and consolidated every five years in future. In drawing up this legislation the sole aim is to safeguard the plant health of our country. That does not mean to say that we embark on the academic task of enumerating all the non-indigenous insects and diseases and banning them willy-nilly. In practice, in order to be fair to the exporters, we nominate the most common of them that are likely to enter international trade, but we reserve the power to deal with any other that is considered to be a potential menace.

/External

External defences against pests and diseases

4. We realise that the United Kingdom is one of the cross roads of the world. Ships and planes bring in produce from nearly every other nation in great quantities and not only the produce spells danger but the vessels and planes themselves. Every year we find Colorado beetles on ships that have not been carrying any vegetable cargoes. It is clear then that our own plant health laws cannot constitute the only line of defence; indeed, we regard them as the third.

5. We think that our first two lines of defence are in the country of origin. We maintain that if producers in other countries wish to develop a long-term trade with us, then it is their primary duty to do everything in their power to eliminate pests and diseases besetting their produce. The second line of defence is the International Health Certificate issued by the Government of the country concerned and after careful field work by yourselves. Whatever the form of the wording of these Certificates, they cannot eliminate the risks of diseases and insects but they do reduce them. Their function, so far as we are concerned, is not so much to stop the arrival of a particular disease or pest but to prevent its arrival continually and in appreciable quantities - the two factors which are most likely to lead to the establishment of an unwanted pest.

6. In the case of all planting material, a health certificate is required, showing that it has been examined in the growing season and found to be substantially free from injurious pests and diseases, including virus diseases, and examined again before despatch. But besides these general provisions, the health certificate enumerates the following specific provisions: (a) that the plants have been grown at a distance of at least 2 kilometres from any place where Wart disease or Black scab of potatoes (Synchytrium endobioticum) has occurred during the ten years preceding, (b) that either Colorado beetle (Leptinotarsa decemlineata Say) is not known to be established within a distance of 25 kilometres from the place where they have been grown, or, if Colorado beetle is known to be so established, there is in operation an intensive system of control thereof. Additional in the case of a number of what might be here termed "soft woody plants" is the requirement that they have been grown at least 20 kilometres from any place where San José scale (Quadraspidiotus perniciosus Comst.) has occurred during the last two years preceding the issue of the Certificate and that, if the pest has occurred during these two years in any part of the country in which the plants were grown, they must, before despatch, have been fumigated with hydrocyanic acid gas at a concentration of not less than 5 grams per cubic metre for at least 30 minutes at a temperature of not less than 7° Centigrade.

7. Similar precise but specialised requirements are also stipulated in the case of health certificates for lettuce, tomato and pea seeds; for potatoes, and for raw cherries, for raw vegetables and for lettuce. The details which are all enumerated in the Importation of Plants Order, 1955, must be already well known to you.

8. The reason here for drawing attention to these specifications is to emphasise the trust which is placed in the field officers in the exporting countries, for there can be no easy short-term methods of determining whether indeed the growing season inspections have been performed satisfactorily.

/Our

Our faith in you, however, is emphasised by the fact that we do not, unlike some other countries, conduct a hundred per cent examination of all certified material on arrival. Our inspectors conduct only "spot checks" to see that the consignments are generally healthy.

Internal defences against pests and diseases

9. Our third line of defence is the important one at the port of entry and is one which is actively manned. Our first point of principle is to refuse entry to produce which requires a health certificate but for which none is presented. Generally speaking we are adamant about this. Any produce incorrectly certified is also likely to be refused, although all cases where genuine slips are suspected will always be fairly investigated. All other produce, whether for planting or for consumption, is subjected to "spot checking" by our inspectors. These checks are administered completely at random, in regard not only to the commodity concerned, the quantity involved, the source of the material and the different ports of entry. There is no question of any countries being singled out for special treatment, but once any non-indigenous insects or diseases have been detected and declared dangerous by our technical advisers, it is customary to examine every subsequent arrival of the commodity. This Summer, for example, once San José scale had been detected on plums and the Oriental fruit moth on peaches and pears, all incoming consignments were subjected to examination no matter from what source.

10. As, generally speaking, all of the pests and diseases against which we legislate internationally are non-indigenous, we are not normally faced with questions regarding tolerances, and only a small rate of infestation is sufficient for the importer to be ordered either to destroy or to re-export the consignment. Nevertheless, a certain amount of discretion is left to the inspectors to determine whether the produce is unhealthy or not, for no specific statistical measurements are included in our wide legal definition of unhealthy, which is "affected with any injurious insect, fungus, bacterium or other organism, or any agent causative of a transmissible crop disease".

11. Discretion is also given to inspectors to allow the treatment of infected consignments as an alternative to destruction or to re-export, in cases where the infestation is not too serious and when it is established that the fumigation process is likely to be successful. Thus, in the Summer of 1957, when the presence of Potato tuber moth was found in shipments of potatoes from the Canary Islands and several Mediterranean countries, treatment with Methyl bromide was prescribed. Again, this Summer, when several shiploads of onions from Spain were found to be infested with Colorado beetles, fumigation with Methyl bromide was also ordered before the cargoes could be accepted.

12. It should be noted, however, that this practice of allowing fumigation at the ports has only recently been introduced and that there is no assurance that the experiment will be continued. Our doubts spring from the fact that the fumigation of perishable commodities is still virtually in its infancy and while the gases may be effective against insects, there are fears that they may affect both the nutritive value and the palatability of the produce itself. We also have to consider whether the knowledge that fumigation would be allowed would not cause some exporters to lower their standards of inspection

/before

before the grain was ripe.

[illegible] The Jews and [illegible] of Hebron spent [illegible] there should be [illegible] in the country [illegible]. [illegible] Philip Hammond stated that [illegible] the Hittite [illegible] Ephraim and Benjamin [illegible] [illegible] [illegible]

18. All condemned consignments normally have to be destroyed or re-exported but sometimes, when infestations are not too high, fumigation is permitted. This type of concession, however, is still in its infancy and may not be continued, even if further satisfactory technical data is forthcoming, because of the possibilities of exporters relaxing their vigilance.

19. I hope this extremely concentrated outline will enable you to follow the aims and objectives of our plant health legislation and will provide enough material for a useful discussion.

Dr.W.Klett, Stuttgart. (Original language: GERMAN).

The dangerous fruit tree pest Quadraspidiotus perniciosus Comst. is one of the most important pests from the point of view of phytosanitary inspection. Those who have only a superficial knowledge of San José scale might think that inspection consists merely of looking for red patches. However, those who are actually engaged in phytosanitary inspection well know that red patches may also be found if other, less dangerous, scale insects are present and that, on the other hand, San José scale does not always provoke red patches. Therefore the main points to be considered during inspection will now be enumerated again.

Before you is a list which contains all plants which, at any time, have been mentioned in scientific publications as host plants of San José scale. In the plant species marked x? it is questionable whether they had actually been attacked. Usually the infestation which was observed must have been accidental; the plants marked x? most probably are not real host plants. The situation is different in the group marked x, though it consists of plants on which mass infestation rarely occurs. For that very reason this group, from the point of view of inspection, is of the utmost importance as the isolated infestation involved might easily be overlooked. If mildly attacked plants of this group - and also of the groups xx and xxx - are taken from a hot climate to be propagated in nurseries in colder regions (where San José scale does multiply, but so slowly that no damage is caused) there is a real risk that the sale of nursery stock from these colder regions to hotter areas will result in continuous contamination of the latter, where conditions for the mass breeding of the pest are favourable. It should not be forgotten that the world-wide spread of San José scale is not essentially due to the transport of infested fruit but to the moving of a great diversity of nursery stock. In addition to the interchange of fruit trees and their cuttings, the exchange of woody ornamental plants is increasing from year to year. We therefore have to intensify our efforts to prevent San José scale from being carried by them. It is known that San José scale - and other Diaspinae - have a capacity for camouflage by inserting themselves under the bark at the time when their shield is formed. This camouflage can also be observed on fruits with a heavy corky formation. It is also known that the colour of the shield is largely dependent on the food which the scale has taken. In this way the camouflage may be ideal. Consequently, woody plants have to be inspected very carefully; the root-neck, dirty as it often is, rings on twigs, leaf-axils and other uneven parts of the bark have all to be examined in order to trace isolated infestation. Often it is extremely difficult to carry out this task properly, especially as railway stations, where inspection takes place, are usually very badly lighted. Therefore, a requirement, which has to be raised repeatedly,

/is

x. See page 16.

is that better light should be provided for inspection work. In addition, it may be helpful, in cases where doubt arises, to moisten the bark. Shells and also red patches in the bark, which otherwise might have escaped attention, then become conspicuous.

It is known that red discoloration, caused by the formation of anthocyan, is a valuable indication of the presence of San José scale. It also occurs with *L. ulmifoliae-formis*, *L. pyri*, *Epidiaspis betulae*, and generally with *Pseudaulacaspis pentagona* and *Parlatoria oleae*. However, the formation of anthocyan can also be due to non-parasitic causes: insect injury, scab patches, injury by hail, for example, and, usually in distinct varieties only, in a general way near the lenticels in fruits. Red patches therefore are not foolproof as an indication. On the other hand many cases have become known where the presence of San José scale did not result in red patches, through lack of sunlight or, as in many currants and also in some fruit, because in the species attacked the genetic composition did not comprise the factor which enables the plant to make anthocyan.

Anyone who has to decide whether an infestation of fruit or other commodities must be attributed to San José scale has a double responsibility. By refusing the infested material he has to prevent the introduction of the pest, but he has also to avoid harming the common market by giving an erroneous decision. Such wrong decisions are apt to be taken when no adult females are to be found but only second stage larvae, in which it is difficult to discriminate between *Q. perniciosus* and the closely related endemic species *Q. ostreaeformis* and *Q. pyri*. Therefore pictures of the characteristics of the pygidium of both the adult female and of the second instar larva, which Brause published in 1950, have now been made available in a convenient form. Pictures of the pygidia of other scales, to be found on fruit imported from the Mediterranean area, have been added. The explanatory text is mainly based on Brause 1950.

(During the course a description was given and illustrations were shown of the following species:

Quadraspidiotus perniciosus (COMST., 1881) PIERCE, 1938
Quadraspidiotus ostreaeformis (CURT., 1843) BERLESE, 1900
Quadraspidiotus pyri (LICHT., 1881)
Aspidiotus hederae (VALL., 1829) STEIN., 1849 (=nerii BOUCHÉ, 1844)
Aspidiotus spinosus COMST., 1881 1894)
Aspidiotus (Semiberlesia) camelliae STEIN., 1849
(=rapulmatus TARG., 1878)
(=Targ COMST., 1881)
Chrysomphalus dictyospermi (MORG., 1889) TRAV., 1903
Chrysomphalus aonidum (L.) ASHM., 1880 (= ficus RISSO, 1813)
Chrysomphalus citri (COMST., 1881) LIND., 1934 (=dictyospermi
aurantii (MASK., 1891) BERL., 1897
Parlatoria oleae (COLV., 1880) LIND.
Parlatoria proteus (CURT., 1843) LIND., 1934 (=pergandei
COMST., 1881)
Epidiaspis betulae (BAR., 1849) LIND., 1934 (= leperii
SIGN., 1869)
Pseudaulacaspis pentagona (TARG., 1886) LIND., 1934)

(Duplicates

Fumigation

In many countries fumigation of woody plants is compulsory upon importation. In the USA methyl bromide is often used, but most countries in Europe treat with HCN. BERAN has done fundamental work on the use of HCN against San José scale.

Prescriptions for the quantity of HCN to be used in the fumigation of woody plants vary greatly. Usually, however, 10g/h/m^3 are used, which guarantees a complete kill of San José scale without damaging the plants. According to BERAN it is of no importance whether before treatment the plants have been kept at plus 10°C or at minus 3°. During the treatment, however, a temperature of at least 5°C must be maintained to obtain satisfactory results. The susceptibility of San José scale to HCN varies in its different stages and also, even in one and the same stage, in the different seasons (BERAN). For example: the difference between the susceptibility of the black-shield stage in November and in January was found to be great, San José scale being more resistant to HCN in January. Experiments carried out by Philipp in 1952 gave the following results: In Central Europe, where fumigation of nursery stock often has to be done in the cooler Spring and Autumn months, fumigation chambers must be fitted with facilities for circulating and heating the gas. Water drops adhering to the plants do not prevent the killing of San José scale, but encrusted soil around the root neck does definitely interfere with the action of HCN. Plants should in any case always be unpacked before being treated.

With regard to the sensitiveness to HCN of deciduous plants, the following remarks can be made: Fumigation of fruit trees in Autumn, when they still have their foliage, is possible. It does not cause damage to the general growth or to the formation of shoots. Fumigation during shoot-formation does not cause damage if the plants are cut back and if, after the treatment, they are replanted as soon as possible. Damage to roots by adsorption of HCN on the moist soil adhering to them has not been observed. Moisture on woody plants (rainwater, dew, hoar frost, condensation water) did not have a noxious effect in any of the experiments. Over-dosage (20g.) can give risks if during subsequent transport the trees remain in a dry condition for an appreciable time. If they are planted at once the growth is not adversely affected, even when the time of exposure has been doubled. The peach tree, often considered to be highly sensitive, was found in these experiments to be resistant. HCN has no effect on lesions through cutting or other reasons. These data justify the conclusion that for fruit trees (with some restrictions with regard to peach trees) fumigation does not present any danger. It could, however, increase the bad effect of incorrect treatments applied previously.

Over-dosage can cause damage to plants, even to those otherwise resistant. In the list of host plants those which are sensitive to HCN are marked S. The degree of sensitiveness depends on a large variety of factors. In principle it should be taken for granted that evergreens are usually highly sensitive. HCN in the form of "Zyklon" cannot be used for fruit as it can easily lead to burning or impart a bad taste.

/Finally,

Finally, it has to be noted that further introduction of other dangerous scale insects from overseas is still by no means impossible. In the Middle West of the USA, especially in the southern part of Illinois, another oystershell-shaped scale (Quadraspidiotus forbesi JOHNSON (1896) occurs. It attacks pome and stone fruit and red currant. In literature it is usually referred to as being harmless. Nevertheless it has developed into a serious pest, at least in Illinois. The Forbes scale has a greyish thin shield, which is "flocky" and has a reddish-orange central patch. The number of generations is given as 1 - 3. Details of the structure of the pygidium have not yet become available.

The example of Quadraspidiotus forbesi shows that in phytosanitary inspection not only the scale insects occurring in Europe have to be taken into consideration; new introductions from overseas must always be borne in mind.

HOST PLANTS OF SAN JOSE SCALE MENTIONED IN LITERATURE
(cf. Doeckel 1953)

X? = Doubtful host plants
X = Lightly infested host plants
XX = Rather heavily infested host plants
XXX = Heavily infested host plants

§ = Sensitive to HCN
§§ = Highly sensitive to HCN

CONIFERAE

Pinaceae

Juniperus oxycedrus L.	X?
Picea canadensis Koehne	X?
Pinus halepensis Mill	X?
Pinus monticola Dougl.	X?
Thuya occidentalis L.	X?
Tsuga canadensis Carv.	X?

POLYCARPICAE

Magnoliaceae

Magnolia soulangeana Soul.	X?

Ranunculaceae

Clematis vitalba L.	X
Paeonia sp.	X
Trollius europaeus L.	X

Aristolochiaceae

Aristolochia durior Hill.	X?

/Lauraceae

Lauraceae

Laurus nobilis L.	X
Sassafras officinalis Nees.	X

Berberidaceae

Berberis vulgaris L.	X?
Mahonia aquifolium Nutt.	XX
Nandina domestica Thunb.	X?

Calycanthaceae

Calycanthus fertilis Walt.	XX
Meratia praecox Rehd.	X

Cercidiphyllaceae

Cercidiphyllum japonicum Sieb.& Zucc.	X

Lardizabalaceae

Akebia quinata Decne.	XXX
Decaisnea Fargesii Franch.	X?

PARIETALES

Dilleniaceae

Actinidia arguta Miq.	X
Actinidia polygama Maxim.	XXX

Tamaricaceae

Myricaria germanica Desv.	XX
Tamarix pentandra Pall.	XX
Tamarix tetrandra Pall.	X

Cistaceae

Cistus monspeliensis L.	XX §
Cistus salviifolius L.	XX

GUTTIFERALES

Guttiferae

Hypericum patulum Thunb.	X §

Theaeceae

Camellia japonica L.	X?

ROSALES

Saxifragaceae

Deutzia gracilis Sieb. & Zucc.	X?
Deutzia scabra Thunb.	X
Hydrangea sp.	X?
Philadelphus coronarius L.	X
Ribes aureum Pursh.	XXX
Ribes grossularia L.	XX

/Ribes nigrum L.

Ribes nigrum L.	XX
Ribes oxyacanthoides L.	XXX
Ribes rubrum L.	XXX
Ribes vulgare Lam.	XX

Pittosporaeeae

Pittospora tobira Ait.	X

Rosaceae

Amelanchier canadensis Medikus	XXX
Chaenomeles japonica Lindl.	XXX
Cotoneaster Franchetii Boisd.	XXX
Cotoneaster frigida Wall.	XX
Cotoneaster horizontalis Decne.	XXX
Cotoneaster salicifolia Fr.	XXX
Cotoneaster vulgaris Lindl.	XXX
Crataegus coccinea L.	XXX
Crataegus cordata Ait.	XXX
Crataegus crus-galli L.	XXX
Crataegus oxyacantha L.	XXX
Cydonia oblonga Mill.	X
Eriobotrya japonica Lindl.	XX
Exochorda grandiflora Lindl.	XX
Filipendula ulmaria Maxim.	X
Fragaria chiloensis var. Ananassa Hort.	X
Kerria japonica DC.	X
Mespilus germanica L.	X
Photinia sp.	X
Physocarpus opulifolius Maxim.	X
Pirus communis L.	XXX
Pirus baccata L.	XXX
Pirus malus L.	XXX
Pirus nigra Serg.	XXX
Pirus sinensis Lindl.	XXX
Potentilla fruticosa L.	XX
Prunus acuminata Michx.	XX
Prunus amygdalus Stokes	XX
Prunus armeniaca L.	XX
Prunus avium L.	XXX
Prunus cerasifera Ehrh.	XXX
Prunus cerasifera var. purpurea Spaeth.	XX
Prunus cerasus L.	X
Prunus Davidiana Franch.	XXX
Prunus divaricata Ledeb.	X
Prunus domestica L.	XXX
Prunus glandulosa Thunb.	X
Prunus hortulana Bailey	XXX
Prunus insititia L.	X
Prunus japonica Thunb.	XXX
Prunus laurocerasus L.	XX
Prunus lusitanica L.	XXX §

/Prunus mahaleb

Prunus mahaleb L.	X
Prunus mume Sieb. & Zucc.	XX
Prunus nana Stokes	XX
Prunus padus L.	XX
Prunus pendula Maxim.	XX
Prunus persica Sieb.&Zucc.	XXX
Prunus pseudocerasus Lindl.	XX
Prunus pumila L.	XXX
Prunus pumila var.Besseyi Bailey	XXX
Prunus salicina Lindl.	XXX
Prunus serotina Ehrh.	XXX
Prunus spinosa L.	XXX
Prunus virginiana L.	XXX
Pyracantha coccinea Roem.	XXX §
Rhodotypos kerrioides Sieb.&Zucc.	X
Rosa canina L.	XXX
Rosa carolina L.	
Rosa humilis var.lucida	XXX
Rosa rugosa Thunb.	XXX
Rosa virginiana Mill.	XXX
Rubus fruticosus L.	X
Rubus Henryi Hemsl.	X?
Rubus idaeus L.	X
Rubus strigosus Michx.	X
Rubus villesus Ait.	X
Sorbaria arborea Schneid.	XXX
Sorbaria sorbifolia A.Br.	X
Sorbaria stellipila Schneid.	X
Sorbus americana Marsch.	XXX
Sorbus aria Crants.	XX
Sorbus aucuparia L.	XXX
Sorbus domestica L.	XX
Sorbus villosa Thunb.	X
Spiraea cantoniensis Lour.	X?
Spiraea japonica L.	XXX
Spiraea pumila Zabel	XX
Spiraea Thunbergii Sieb.	X
Stranvaesia Davidiana Decne.	XXX §

Papilionaceae

Acacia dealbata Link.	X?
Acacia trinervis Desv.	X?
Albizzia julibrissin Durazz.	X
Caragana pygmaea DC.	X?
Cercis siliquastrum L.	XX
Cytisus praecox Bean.	X
Cytisus scoparius Link.	XXX
Cytisus trifolorus l'Hérit.	XXX
Desmodium sp.	X
Genista sp.	X
Gleditschia triacanthos L.	XX
Laburnum vulgare Griseb.	X?

/Lespedeza Thunbergi (DC.) Nakai

Lespedeza Thunbergi (DC.) Nakai	XX
Robinia pseudacacia L.	X
Sophora japonica L.	X?
Spartium junceum L.	X
Wisteria chinensis DC.	X?

HAMAMELIDALES

Hamamelidaceae

Corylopsis spicata Sieb. & Zucc.	X

Platanaceae

Platanus acerifolia Willd.	X
Platanus orientalis L.	X

MYRTALES

Punicaceae

Punica granatum L.	X?

Elaeagnaceae

Elaeagnus multiflora Thunb.	X
Elaeagnus pungens Thunb.	X
Hippophae rhamnoides L.	X

Lythraceae

Lagerstroemia indica L.	X

Myrtaceae

Callistemon lanceolatus DC.	X?
Eucalyptus globulus Lab.	X? §
Myrtus communis L.	X? §

COLUMNIFERAE

Malvaceae

Althaea sp.	X
Hibiscus palustris L.	XX
Hibiscus syriacus L.	X?
Pavonia sp.	X

Tiliaceae

Tilia americana L.	XX
Tilia grandiflora Ehrh.	X

TEREBINTHALES

Rutaceae

Choisya ternata HBK.	X §
Citrus arantium L.	X ?
Citrus medica L.	X?
Citrus nobilis Lour.	X?

/Citrus trifoliata L.

Citrus trifoliata L.	XX §
Ptelea trifoliata L.	XX

Aceraceae

Acer campestre L.	X
Acer palmatum Thunb.	X
Acer platanoides L.	X
Acer pseudoplatanus L.	X
Acer saccharinum L.	X

Sapindaceae

Koelreuteria paniculata Laxm.	X

Hippocastanaceae

Aesculus hippocastanum L.	X?
Aesculus parviflora Walt.	X?

Anacardiaceae

Cotinus coggygria Scop.	X
Rhus coriaria L.	X
Rhus glabra L.	X
Rhus typhina L.	X

Simarubaceae

Ailanthus glandulosa Desf.	X?

Staphyleaceae

Staphylea sp.	XX

CELASTRALES

Aquifoliaceae

Ilex aquifolium L.	XX

Celastraceae

Evonymus europaeus L.	XX
Evonymus japonica L.	X

RHAMNALES

Rhamnaceae

Ceanothus americanus L.	X
Rhamnus cathartica L.	X

Vitaceae

Ampelopsis sp.	X
Parthenocissus quinquefolia Planch.	X?
Parthenocissus tricuspidata Planch.	X?
Vitis vinifera L.	X

/UMBELLIFLORAE

UMBELLIFLORAE

Cornaceae

Aucuba japonica Thunb.	X?
Cornus alba L.	X
Cornus alba var.sibirica Lodd.	XX
Cornus alternifolia L.	X
Cornus amomum Mill.	X
Cornus circinata L'Hér.	X
Cornus femina Mill.	X
Cornus florida L.	X?
Cornus florida var.rubra Rhed.	X
Cornus mas L.	X
Cornus sanguinea L.	XX

Araliaceae

Aralia spinosa L.	X?
Hedera colchica Koch.	X?
Hedera helix L.	X?

Umbelliferae

Daucus carota L.	XX

FAGALES

Betulaceae

Alnus glutinosa Gaertn.	XX
Alnus incana Willd.	XX
Betula verrucosa Ehrh.	X
Carpinus betulus L.	X?
Corylus avellana L.	X?

Fagaceae

Castanea dentata Berckh.	X
Castanea sativa Mill.	X
Fagus silvatica L.	XX
Fagus silvatica var. purpurea Ait.	XX
Quercus pedunculata Ehrh.	X?
Quercus rubra L.	X?

JUGLANDALES

Juglandaceae

Carya pecan Engler & Graebn.	X
Juglans nigra L.	XX
Juglans regia L.	X
Juglans sieboldiana Maxim.	XX

PIPERALES

Piperaceae

Piper sp.	X?

URTICALES

Ulmaceae

Celtis occidentalis L.	X
Ulmus campestris L.	X
Ulmus effusa Willd.	X
Ulmus glabra Mill.	XX
Ulmus scabra Mill.	X

Moraceae

Ficus carica L.	X?
Maclura aurantiaca Nutt.	XXX
Morus alba L.	X?
Morus nigra L.	X?

Urticaceae

Urtica dioica L.	X

SALICALES

Salicaceae

Populus alsba L.	X
Populus canadensis Moench.	X
Populus deltoides Marsh.	XXX
Populus nigra L.	XX
Populus nigra var. Pyramidalis Spach	XXX
Populus tremula L.	X
Salix acutifolia Willd.	X
Salix alba L.	XX
Salix alba var. vitellina Seringe	XXX
Salix babylonica L.	XXX
Salix caprea L.	XX
Salix elegantissima Koch	XX
Salix gracilistyla Miq.	X
Salix incana Schrank	XXX
Salix lucida Mühl.	XXX
Salix pentandra L.	XX
Salix purpurea L.	X
Salix viminalis L.	XX

POLYGONALES

Polygonaceae

Polygonum Aubertii Henry	X?

CENTROSPERMAE

Chenopodiaceae

Atriplex sp.	X

TRICOCCAE

Euphorbiaceae

Aleuritis fordii Hemsl.	X
Euphorbia centroides L.	X?

/Euphorbia spinosa L.

Euphorbia spinosa L.	X?
Ricinus communis L.	X

Buxaceae

Buxus microphylla Sieb. & Zucc.	X §
Buxus sempervirens L.	X

BICORNES

Ericaceae

Arbutus unedo L.	X
Azalea sp.	X
Kalmia latifolia L.	X?
Vaccinium myrtillus L.	X?
Vaccinium vitis idaea L.	XXX

DIOSPYRALES

Ebenaceae

Diospyros kaki L.	X?
Diospyros lotus L.	X
Diospyros virginiana L.	X

TUBIFLORAE

Convolvulaceae

Convolvulus arvensis L.	XX

Polemoniaceae

Phlox sp.	X?

Verbenaceae

Callicarpa japonica Thunb.	X?
Caryopteris incana Miq.	X?
Clerodendron trichotomum Thunb.	X?
Vitex agnus-castus L.	X

Scrophulariaceae

Paulownia tomentosa Steud.	X?

Bignoniaceae

Campsis grandiflora K. Sch.	X?
Catalpa bignonioides Walter	X
Tecoma capensis Lindl.	X

CONTORTAE

Apocynaceae

Nerium oleander L.	X?
Trachelospermum jasminoides Lem.	X?

/Asclepidiaceae

Asclepidiaceae

Asclepias syriaca L.	X

Loganiaceae

Buddleia Davidii Franch.	X

LIGUSTRALES

Oleaceae

Forsythia intermedia Zabel	X
Forsythia suspensa Vahl.	XX
Fraxinus americana L.	X
Fraxinus exelsior L.	X
Fraxinus ornus L.	X
Jasminum grandiflorum L.	X?
Jasminum nudiflorum Lindl.	X?
Ligustrum ovalifolium Hassk.	XX
Ligustrum sinense Louv.	XX
Ligustrum vulgare L.	XXX
Olea europaea L.	XX
Osmanthus aquifolium Sieb.	XX
Syringa chinensis Willd.	XX
Syringa persica L.	XXX
Syringa vulgaris L.	XX

RUBIALES

Caprifoliaceae

Diervilla sp.	X
Lonicera chrysantha Turcz.	XX
Lonicera japonica Thunb.	X?
Lonicera Ledebouri Esch.	XX
Lonicera nitida Wilson	X
Lonicera periclymenum L.	X
Lonicera pileata Oliv.	XX
Lonicera tatarica L.	XX
Sambucus nigra L.	X?
Symphoricarpus racemosis Mich.	X
Viburnum cassinoides L.	X
Viburnum lantana L.	X
Viburnum opulus L.	X
Viburnum rhytidophyllum Hemsl.	X
Viburnum tinus L.	XX

CUCURBITALES

Cucurbitaceae

Citrullus vulgaris Schrad.	XXX

SYNANDRAE

Campanulaceae

Lobelia sp.	X?

Compositae

Chrysanthemum indicum L.	X?
Dahlia sp.	X?

LILIIFLORAE

Liliaceae

Lilium bulbiferum L.	X
Ruscus hypophyllum L.	X?
Yucca sp.	X

GLUMIFLORAE

Gramineae

Panicum sanguihale L.	X?

Prof. Rui, Verona. (Original language:
Read in his absence by Mr. Bonomi. FRENCH).

I will not limit myself to talking about the methods of inspection in Italy in regard to possible contamination by San José scale of fruit for export - if I did I would not have much to say and could not speak for the length of time allotted to me. On the other hand I would not wish to depart from the real subject, but to amplify it, in order to be useful to the participants in the course, by speaking also of the situation in regard to San José scale in Italy, the organisation of the Italian phytosanitary service, and control methods, particularly those which ensure complete disinfestation of the fruit before despatch and how to know that the scale is in fact dead after the treatment.

With these aims - which I hope are welcome to the organisers of the course, to whom I address all my thanks for the honour they have done me in making me responsible for this communication - I will start without further delay to deal with the subject.

1. The situation in Italy in regard to San José scale

As is already known, the San José scale (Quadraspidiotus perniciosus) is a Diaspine which came originally from the Far East (Northern China) and was found for the first time in California in 1873, in an orchard in the locality of San José, and was described by Comstock in 1880.

It was found in Italy in the Province of Lucca shortly before the last world war on some fruit trees imported from North America, and it is now present especially in the fruit-growing areas of the plain of the river Po and in Tuscany, attacking mainly apple, pear, quince, peach, plum, apricot, almond and cherry trees - more rarely fig trees and vines.

In Italy the scale usually hibernates as first stage larva (according to Gambaro and Bongiovanni) and as second stage larva (according to Melis and Grandori); there are three generations, probably only two in the alpine valleys, but four on the Adriatic coast in the province of Venetia, and five generations in Tuscany.

In the province of Verona, according to the research carried out by Dr.Gambaro, male and female scales are adult at the end of April; the first generation starts in May-June, and finishes in August; the second starts in August and finishes in October; and the third is from October to the following May, with six months Winter diapause.

According to Malenotti, the San José scale has the rare but not exclusive characteristic of colouring red the plant tissues around the place where the scale attaches itself, this colouration being the reaction of the tissues themselves to the saliva of the scale - it becomes a round patch around the shield of the insect, and can be of 3 - 4 mm to half a centimetre in diameter on apples, then on the pulp.

It is necessary to state - in order to avoid an error

of diagnosis when inspecting produce for export - that the red colouration of the fruit can also be caused by other scales wuch as Diaspis pentagona Targ., Quadraspidiotus ostreaeformis Curt. and Parlatoria oleae Colv.

It is also very important to know the views of the main Italian scientists on the methods of spread of San José scale, and the part which fruit can play. All writers agree that the main cause of spread is by nursery stock and grafts imported from an infested country into a country still free, and I would add that according to Malenotti (1946) peaches without stalks can never carry the San José scale.

In regard to apples, pears and other fruits, Malenotti assures that there is nothing to fear, because their very usage excludes the possibility of any larvae reaching host trees, since from the middle of December to the middle of May (i.e. the period of exportation of these fruits) larvae do not form in Italy. Melis, on the other hand, thinks that there is some danger, however small it may be, through fruit kept in warm restaurants in Winter; neonates can be produced capable of infecting ornamental plants on the spot, which in turn could transmit infestation to fruit trees if they were put out in the garden.

Careful experiments carried out by Melis show that the period during which a neonate can migrate can last at the most 3 hours 47 minutes, and they move on fruit at a speed of 52 cms an hour. That means that the risks of infestation are almost nil.

Still according to Melis, the scale can only pass from one fruit to another if they touch; if fresh skins of fruit bearing scales are placed on the twigs of living plants, there is no spread as the scales die. In any case Melis admits the possibility of selling fruit which is not very heavily infested by the San José scale - it must be strictly separated, both for selling and for phytosanitary reasons.

II. Organisation of the Italian Plant Protection Service

The service for the inspection of fruit and nursery stock for export, concerning San José scale, is directed in Italy by the Ministry of Agriculture and Forests (General Direction of Agricultural Production - Phytopathological Service) and carried out at the frontier posts by the phytopathological Observatories and by the Institute for Foreign Trade. The Observatories have jurisdiction over a region or group of provinces. Some of them (such as Bolzano, Cagliari, Catanzaro, Genoa, Gorizia, Pescara, Rome, San Remo, Turin, Trieste and Verona) are regional offices of the Ministry, whilst the other Observatories (Acireale, Bari, Bologna, Florence, Milan, Modane, Palermo, Pavia, Perugia, Pisa and Portici) are attached to the Faculty of Agriculture of the University, to experimental stations, or to other Institutes.

The Phytopathological Observatories carry out, under certain conditions which I will explain further on, the phytosanitary inspection of nursery produce, apples and cherries; for all other sorts of fruit - peaches, pears, plums, apricots, almonds, oranges, lemons, etc) such inspection is now the responsibility of the Institute of Foreign Trade, carried out as an addition to the quality inspection.

In any case the work of the Institute of Foreign Trade is governed by the same principles as the Observatories - granting a certificate signed by the Director of the Observatory, or by one of his staff, if the inspection is satisfactory.

All countries which import fruit, plants and parts of plants from Italy have requirements in regard to freedom of the produce from San José scale - freedom which must be certified by the exporting country. The following is the list of plants which different countries require to be free from San José scale at the time of despatch:

COUNTRY	PRODUCE
Austria	cherries, apples, pears, peaches, plums, plants and any parts thereof.
Belgium	peaches.
Bulgaria	oranges and lemons, bananas, dates, locust beans, pomegranates, grape-fruits, other southern fruits, plants and parts of plants.
Czechoslovakia	fresh fruit, plants and parts of plants.
Egypt	fresh fruit, plants and parts of plants.
Finland	vegetables, plants and parts of plants.
France	oranges and lemons.
Germany	fresh fruit.
England	plants and parts of plants.
Yugoslavia	plants and parts of plants.
Luxembourg	plants and parts of plants and fresh fruit.
Holland	plants and parts of plants.
Poland	apples and pears.
Switzerland	fruit in general (apples, pears, quince, medlars, sorb-apples, kakis, plums, cherries, peaches, apricots, fresh almonds, currants, raspberries, mulberries, green figs) plants and parts of plants.
Tunisia	fruit in general, vegetables, plants and parts of plants.

To complete this section, I can say that according to my personal experience, some importing countries (e.g. Germany and Switzerland) are very strict and demand the complete freedom from San José scale of the plant produce intended for them, whilst others, on the contrary, allow a certain tolerance (e.g. France, Belgium).

On the other hand, whilst respecting the requirements whereby goods leaving Italy must in no way be infested by the scale, I personally think that it should be taken into consideration that the pest is more or less present in all countries and that in regard to the rôle attributed to the danger of spread by fresh fruit, consideration should be given to the results of the careful experiments carried out by the Italian authors quoted above.

III. Methods of inspection of fruit

Control carried out in Italy aims at preventing to the greatest possible extent the crossing of the frontiers of consignments which are infested, even to a very small extent, with Quadraspidiotus perniciosus Comst.

I say "to the greatest possible extent" because in work of this sort it is inevitable not to give an erroneous decision sometimes since only a small part of the goods can be inspected, i.e. a certain number of cases or sacks out of the hundreds in the railway waggon.

There can be a small infested part of the consignment infested by San José scale among the proportion which is not inspected, and nevertheless the phytosanitary certificate will be given by the inspector in all confidence, but he cannot nevertheless be in a position to guarantee that the said goods will be accepted by the importing country.

The other reasons why it is impossible to guarantee complete freedom are practical in character, i.e. the requests for inspection occur during certain periods of the year, when insufficient personnel is available and only a few hours a day can be given to the work to satisfy the requirements of the exporters. We certainly cannot claim that in that case the inspection is carried out with all desirable care, but I can assure my colleagues from the plant protection services of other countries that it is in the interests of Italy, both morally and materially, to export fruit completely free of San José scale. If that is not the case (that is, if the scale is found on produce) they must consider it as an unfortunate thing which has happened to the man who carried out the inspection when the goods were despatched, and be as tolerant as they can be.

But let us return to our subject, that is methods of inspection of fruit and the procedure in Italy. Inspection is carried out at the request, in writing, of the exporter, on the previous day if the inspection has to be made outside the place where the Observatory is situated, or in the morning if it is made in the place itself. The Inspector is the phytopathological delegate of the Ministry of Agriculture and Forests and has a card issued by the Ministry. He carries out a first inspection in the storehouse, then in the waggon. If he is very busy, he will inspect only the fruit already loaded. He has a certain number of cases (normally a dozen chosen at random) unloaded and he examines them one by one (also with a magnifying glass), particularly the place where the scale is normally found. He issues a certificate only if the inspection is favourable, otherwise he refuses the consignment, which can be presented again the next day, that is after being completely revised by the exporter.

Experience has shown us that it is the exporters who have the greatest responsibility in regard to the more or less perfect health condition of the produce to be exported. All the Italian Observatories have for a long time known the commercial firms in their area, and it is natural that the most stringent inspection should be made of the produce of the less well-equipped and less diligent of them - perhaps by a sudden unexpected visit to their place of storage.

It is also the task of the Observatories to see that the storage places are suitable for handling fruit. They must be well-lighted, either by natural or artificial means, in order to facilitate the work of inspection, selection, cleaning and packing. The Observatories hold periodical courses of instruction for those working in the fruit trade.

Finally on this subject, the question sometimes arises, particularly with peaches, as to whether the red colouring on the fruit is due to Diaspis pentagona Targ. or Quadraspidiotus perniciosus Comst. From my own experience I can say that in the first case there is a characteristic white secretion in the middle of the small red patch, whilst in the second case there is a brown follicle.

IV. Control of San José scale and the effectiveness of disinfestation processes

In Italy the control of San José scale was made compulsory by Decree of December 20, 1940 of the Minister of Agriculture and Forests, in order to safeguard the national fruit-growing industry and ensure the production of fruit for export. This Decree also provides for Prefectorial Orders in the provinces where they are thought necessary, and for sanctions against those who fail to carry out control measures. In fact if control is not rational and complete (i.e. if there remain some orchards untreated in a certain zone) all the efforts and sacrifices of those who apply the treatments could be made useless. It is therefore logical to require a generalisation of treatment.

From my own experience I can say that the basis of control of San José scale is treatment carried out at the end of the Winter (whilst the vegetation is still dormant) or else at the moment of opening of the buds; in the first case, treatment is with lime sulphur wash and barium polysulphides (sometimes with added miscible oils) and in the second case with mixtures of mineral oils with added phosphoric esters.

In general, if the treatments are technically well applied (i.e. if the products are well spread on the trees with no gaps) every year, that is sufficient to overcome any infestation by San José scale, and since during the period of vegetation phosphoric ester treatments are necessary against other fruit-tree pests (aphis, Cydia pomonella, psylla, etc) these can be useful against any remains of San José scale infestation.

But in spite of the improvement in technical methods, the increase in treatments, the continual help given to the growers, it is not possible in Italy (or in any other country) always to achieve everywhere a fully

satisfactory result. There are many reasons for this, apart from the quality of the products, which cannot be foreseen, depending on meteorological factors, the care taken and the good timing of treatments, the virulence of the pest, etc.

In addition to the phytosanitary control already described, careful disinfestation, naturally in agreement with the importing country, has proved its worth. The Italian Ministry of Agriculture and Forests has for a long time encouraged study and research to ensure that the processes employed really do kill any San José scale which may be present on fruit, without affecting appearance and taste. Since 1952 I have been responsible for disinfestation in "artificial atmosphere" with the Gasconserv system, and I can give further information about this to the participants in the Course.

The Gasconserv system allows the ripening, keeping and disinfestation of plant produce in general with a single installation comprising metal chambers, completely hermetic, of varying capacity according to the produce to be placed in them (e.g. lorries and railway waggons).

The disinfestation (it is better to say fumigation) by the Gasconserv process is carried out at normal pressure, twice consecutively: contact of the produce, and thus the pests, with a determined gas atmosphere for a relatively short time; addition of a fumigant whose action requires 2 - 4 hours. It should be pointed out that the components of this "artificial atmosphere" do not produce during the process any reaction either between themselves or with the poison, or with the produce being treated; they are neither inflammable nor explosive, nor are they toxic, and are free from hydrocarbons. The toxic substance used is Methyl bromide, because of the particular characteristics of this fumigant, which is easily diffused, and gives rise to no phenomena of resistance and revival of the pest. To ensure that the scales are dead, it is only necessary to observe the appearance of the blackening of the tubular lateral-dorsal glands of adult females, which is considered as a positive proof by all those who carry out research on scale insects.

For disinfestation with the Gasconserv system, the produce is first put into the chamber, which is hermetically sealed, an atmosphere of 3 components being introduced in which the fruit will remain for 2 hours. The methyl bromide is then added in limited quantity and the produce remains in contact with it for 3 more hours, there being a well regulated interior ventilation system. Air is then introduced to eliminate the methyl bromide, and lastly the chamber is opened for general ventilation, which eliminates all trace of the fumigant. To ensure that the insect is dead, as already stated, the blackening of the tubular lateral-dorsal glands of the adult female San José scale is observed.

From the results of innumerable laboratory experiments (with glass vessels with hermetic seal), and in the fumigation chamber, I can give the following résumé:

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Product	Infestation	Methyl br. gr/cu metre	Methyl br. Hrs.	Temperature C°	Relative humidity %	%age mortality on extraction
Apples	SJS.	43	3	24	90	100
Pears	"	40	3	21	85	100
Peaches	"	35	3	21	80	100

This shows how with small quantities of Methyl bromide - i.e. 35 - 43 gr. per cu.metre - it is possible to obtain, with a time of exposure to the fumigant of 3 hours, complete mortality of any scales present on the fruits indicated. Mortality can easily be verified microscopically by the blackening of the tubular lateral-dorsal glands of the adult female, which can be observed before the time indicated in the table.

I would add that the therapeutic results which can be reached with the "artificial atmosphere" of the Gasconserv system have been completed by careful examination of the appearance of the products treated, from the phytotoxic, organoleptic and toxicological points of view, and it has been found that the characteristics of the fruit are never endangered, either in regard to appearance or taste.

To sum up, all the foregoing assures us that such treatment can usefully be carried out for fruit and other produce in international trade and gives at the same time the maximum guarantee as to the health condition of the produce.

Prof. M. Benlloch, Madrid. (Original language: FRENCH).

Phytosanitary inspection services are governed by standards of a general character and, in addition, by special standards in the case of certain plant products or types of product which require that upon inspection their particular properties, the packing of the consignments, the means of transport and even the time of the year and the country of destination be taken into consideration.

In view of the limited scope of the subject I have been asked to treat, this paper will definitely deal with fruit inspection, but not with each kind of fruit separately. This would be impracticable in the time available and, moreover, it would be unnecessary for the present qualified audience.

The problem will be treated in a general way but in certain cases more details will be given, especially with regard to Mediterranean fruit fly and San José scale and the fruit they mainly attack, in order to illustrate as clearly as possible how inspection work should be carried out to ensure the greatest possible measure of success.

The tasks of the Inspection Service consist of:

a). The obligation of exporting countries to provide phytosanitary certificates and, if possible, to have full knowledge of the zone where the produce was grown.

b). The examination of the consignment as a whole.

c). The taking of samples and their examination.

d). The issuing of a certificate or the decision as to the steps to be taken on the grounds of the results obtained in the inspection.

It is evident that exporting countries must necessarily provide a phytosanitary certificate as this is an initial indispensable guarantee; but it is also very advantageous if the zone where the produce was grown is known. The latter condition not only allows possible complaints to be adequately met but it would enable technicians from importing countries to obtain full information on phytosanitary conditions during friendly visits to the regions of production. It stands to reason that this would not be worth while with regard to commodities travelling in small quantities, but for produce being imported in large quantities such visits would be both successful and helpful, and the expenditure involved would be fully justified, as has been experienced on several occasions.

The examination of consignments as a whole is always to be recommended and is of course customary with small lots. It primarily gives an overall picture of the conditions in which the shipment took place and it enables the regions where conditions are worst to be traced, either through their location or their unfavourable climate. It might also reveal the presence of a pocket of infestation or of a railway waggon or number of sacks containing produce in bad condition, which otherwise might

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have escaped attention, as the taking of samples is always more or less dependent on the size of the consignment.

The taking of samples should be based on the overall examination and the following points should be observed:

a. volume and total quantity of the consignment;
b. means of transport;
c. type of drum or sack and processing;
d. the fruit concerned;
e. the pest liable to be found;
f. the time of the year;
g. the region from which the goods were shipped.

a. It is logical that the sample should be proportional to the quantity in total of the consignment, but only to the extent required to guarantee adequate inspection and always within limits, as inspection should not unduly hamper trade. Action which would seem impracticable or superfluous should be avoided under normal conditions. If overall inspection did not reveal any suspected or plainly bad parts, the sample should be small, but it should be taken from different places and not from a single one. If a suspected lot has been found during overall inspection the examination of that lot should be intensified, but samples should also be drawn from other lots. It is difficult to lay down a fixed rule. A sliding scale from 1% to 10% in inverse proportion to the total weight or the number of packages, and taking into consideration not only the total weight but also the part of the consignment from which the fruit to be examined is taken, might generally be a useful standard; an exception should be made for large numbers of packages all coming from the same place of origin, when the percentage should be further decreased. For instance, if a consignment consists of 100 railway waggons, 10 of these might be selected after or during overall inspection for more careful examination of the produce; but there is no need to examine the total contents of each of these 10 waggons, as it is sufficient to take samples from those which appear to be suspect. In the case of 10,000 or 15,000 packages or baskets coming from one place, it will be sufficient to inspect 1% or 0.5% of them. If, however, a consignment consists of lots coming from different places, samples should be taken from each of them.

b. The means of transport also plays an important rôle. During air transport a pest will have less opportunity of developing, in view of the limited time between picking and arrival at destination. There is a considerable difference also between conveyance in fast fruit trains or refrigerated waggons, and between ordinary or special fruit ships.

c. The method of packing and processing also has to be taken into consideration. It makes a lot of difference whether wooden crates, cardboard boxes, wicker baskets or string bags are used, and also whether or not fruit is despatched wrapped in paper or embedded in straw, flock or powdered cork. Also the position of the fruit within the package should be observed; usually the upper layer of produce contains the best fruit, but near the bottom there may be infested or blemished fruit. It is therefore recommended to open the bottom of some baskets or other containers and, in the case of fruit despatched in a single layer, to inspect the hidden side as well.

Moreover the kind of fruit inspected and the pest against which a country desires to protect itself is also of

major importance: San José scale is not likely to be found on oranges or Ceratitis on tomatoes.

In some fruit-growing regions of Spain it is impossible to find oranges attacked by the Mediterranean fruit fly. Aonidiella aurantii has not been found in any of the Spanish orange groves, but it does exist in other citrus growing countries.

The taking of samples should be governed by all the foregoing considerations.

The practice of sample examination

When a sample has been taken according to the points set out above, it is never sufficient merely to examine it with the naked eye. A glass with a magnification of 10 or 20 should be used to find easily identifiable pests and damage and to delimit spots which must be examined with a binocular microscope of 32 times magnification or, better still, with objectives of 125 or 150 times magnification. When looking for diseases or for pests which are either not visible to the naked eye or do not give clear symptoms, it is necessary to make slides and to examine them under a microscope of 600 to 1000 times magnification; it may also be necessary to keep the suspected material in a humid air chamber at 25 to 30°C before examination.

The stations or places of inspection cannot always be sufficiently equipped and even those which are should be in direct contact with a specialised laboratory, where minute observations can be made and where pests which are new, which could not possibly be traced by the inspectors, or which are only present in their larval stage, can be identified.

Inspectors must have a good knowledge of the pests against which countries wish to protect themselves or which are not permitted entry in the countries of destination. They should also know the symptoms those pests provoke. However, they cannot be expected to be specialists; this would be impracticable and unncessary.

Measures to be taken on the ground of results obtained in inspection

A variety of measures can be taken after the results of inspection are known.

Frequently, infested or even suspected lots or consignments are refused. On other occasions parts of the consignment are sorted out in such a way as to eliminate infested lots or to reduce their influence to an acceptable level. Disinfection is possible if suitable installations and efficient methods of fumigation are available. It is carried out either by a private firm working under the supervision of the officials and according to their instructions, or by the officials themselves. In some cases the country of origin has been authorised to carry out the treatment. Unfortunately this procedure has up to now seldom been brought into practice as far as fruit is concerned. Another system which has sometimes been employed consists of assigning the produce to a processing industry where the pest concerned is automatically destroyed. Often it is necessary to require the return of the produce to its place of origin, or that it be sent elsewhere. However, in extreme cases, the only solution is for the produce to be destroyed by burning or

made unfit for further use. Finally, with the experience obtained during inspection and after consulting the specialists, some countries have succeeded in establishing periods during which the moving of produce is permissible, or in fixing certain dates up to which produce can be accepted. If this solution is possible it simplifies matters a lot. Decisions with regard to the establishment of such periods are made on the grounds that the pest or disease does not exist in the country where the produce is grown or could hardly attack such produce, or, on the other hand, would in practice not be able to develop in the country of destination.

List of phytosanitary prescriptions

All inspectors should have a complete list of the pests or diseases which are the subject of phytosanitary regulations, and also of the symptoms caused by pests or diseases of similar appearance with which they could easily be confused. It is also to be recommended that stations or centres of phytosanitary inspection should have filed the legislation of all countries with which they have commercial contacts. This should be kept as complete and as up-to-date as possible.

Remarks on the Mediterranean fruit fly (Ceratitis capitata)

This is doubtless a very polyphagous insect which attacks ripe fruit. Nevertheless it is possible in practice to establish three categories of fruit that is usually marketed, namely:

1. Heavily attacked or susceptible fruit, including:

   Peaches in general (late varieties more than earlies)
   Figs (Summer figs are less subject to attack)
   Khakis
   Apricots (especially late varieties)
   Pears
   Apples

2. Fruit less liable to attack:

   Oranges (especially the late and early between-season varieties)
   Grapes (late varieties in areas where, and periods when, other fruit is lacking: in moderate to hot climates)
   Plums (normally little subject to attack, except in years with high fly populations)
   Bananas (in this case it can normally hardly occur that the fruit be punctured - spotted - before picking. The fruit is picked in an unripe condition when it does not attract the fly. Ripening takes place during transport and in storage before marketing)

3. Fruit which is practically non-infestable

   Melons
   Water melons
   Tomatoes

/Description of the insect

Description of the insect

It is necessary to know details of the different stages.

Egg: shining white. Smooth. Elongated elliptical, but in general convex on the dorsal side and flat or slightly concave on the ventral side; with a tubercle at the anterior end. (0.9 - 1.1 mm. x 0.2 - 0.25 mm).

Larva: creamy white. Apodous. Elongated and conical anterior end. Posterior end cylindrical. Antennae with two joints, the basal one being as long as it is broad, the apical being less broad and with a rounded end. Mandibles hooked and black. Anterior stigmata with 8 - 10 lobes. Protruding posterior stigmata in two groups of three grooves each, bearing long hairs on the central and lateral parts arranged fan-wise (6.8 - 8.2 mm. x 1.5 - 2.0 mm).

Pupa: chestnut brown. Elliptical, but slightly more convex on the dorsal side, especially in the posterior half (4.0 - 4.3 mm. x 2.1 - 2.4 mm).

Adult: slightly smaller than the common house fly (4.5 mm. long). Yellowish head with short three-jointed antennae, the third joint being larger than the others and covered with black hairs and in the case of males carrying two setae ending in a black rhomboid. Thorax with black and grey patches towards the dorsal part and with a glittering black scutellum. Hyaline wings with dark patches. Yellowish legs. The abdomen has yellow and grey fringes, the apex of the female being well-pointed, covering the ovipositer which, when extended, can measure 1 mm. or more.

A larva which might be mistaken for Ceratitis is that of Drosophila. It can, however, be easily and surely distinguished as its posterior stigmata are situated on two finger-like appendices. In addition the mandibles of Drosophila are saw-toothed. Sometimes it has been thought that Ceratitis was present when larvae of Anarsia lineatella or Cydia molesta were found in stone fruit such as peaches, apricots or plums. This confusion, however, is inexcusable, as the larvae of those two species have both thoracic and prolegs and, in addition, a well-developed head. Likewise, when oranges are attacked by larvae of Myelois ceratoniae or Cryptoblabes gnidiella, no confusion should arise as these again are true caterpillars.

The carrying out of inspection

After the choice of the packages to be inspected (sacks, baskets) both the outside and the inside should be examined and also any paper used to wrap the fruit. Larvae about to pupate and the pupae themselves are nearly always found outside the fruit.

Mouldy or soft specimens of fruit should be chosen or those showing spots which are soft or dark or yellowish or of colour other than normal, but also some of sound appearance. They should be examined with a glass of 10 to 16 times magnification and suspected exterior parts must be put under a binocular microscope of at least 32 times magnification, and they are opened with a lanciform preparation needle in order to trace egg-laying chambers, eggs and larvae and their tunnels.

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In oranges the place where the skin has been punctured for oviposition can very easily be detected, more so in the case of sterile stings than in the fertile stings, as the former develop a scar; in prematurely ripe fruit a coloured ring forms around the place of the sting. In grapes the puncturing is also obvious, but in peaches and other fruit a binocular microscope of 32 times magnification is necessary. The greatest difficulty of detecting stings is experienced with fruit which was punctured very shortly before picking and arrival at its place of destination only 24 to 36 hours later. However, in this case the risk is remote; apricots, peaches, etc. will normally be eaten immediately after arrival and the short lapse of time would not allow the insect to complete its development. The same would apply if the fruit went into cold storage, as the temperature at which all development of Ceratitis ceases has been estimated at 10°C. The most serious risk of spread is with the larvae about to pupate and with the pupae, but these stages are the most easily discovered. With regard to oranges, one should distinguish between stung fruit and wormy fruit. The former do not present any risk as to spread as they only contain dead eggs or larvae, whereas the latter contain live larvae.

The skin of oranges contains many essential oil glands. It has been found that these oils have an insecticidal action against newly hatched larvae and against eggs. If in puncturing the skin a female tears a gland with its ovipositor, the outflowing oil dampens the egg and kills it. Even if this does not happen, the newly hatched larvae seeking their way through the skin may easily tear one of the tiny glands and they are then exposed to the insecticide it contains and do not succeed in reaching the pulp of the fruit, where they could happily continue their development. This explains why so often fruit is found to be punctured (sometimes up to 5 and 6 times) but nevertheless containing neither eggs nor living larvae and the pulp undamaged. I refer to the Spanish Levant region, because elsewhere this does not happen.

Oranges which are punctured at an early stage may prematurely attain an appearance of ripeness. During the whole period of actual ripening, however, only the external appearance is affected - both quality and taste remain unchanged. Nevertheless this fruit is slightly more susceptible to moulds, which is due to the injury to the skin upon egg laying, which did not scar quickly. Fruit containing live larvae also shows premature ripeness, but in that case there is always depreciation of the quality, the taste or the savour, and in addition moulds will develop readily. The more essential oil the different orange varieties contain, the more resistant they are to Ceratitis. For this reason it is rare for the pest to attack mandarines or oranges of the Spanish variety "Commune". In any case the number of fruits which become wormy is in the case of oranges always very low in proportion to the number of punctured fruits. With peaches and apricots, however, it can rightly be said that "punctured fruit always means wormy fruit".

According to Mc.Bride's experiments, the development of the egg at 30°C only takes 1 to 2 days. This means that if suspected fruit is put in an incubator at 30°C and with 75% to 85% relative humidity, all larvae of living eggs are necessarily brought to activity within 24 hours. The eggs must have been laid before despatch from the country of origin and by placing them in optimum conditions of temperature and humidity their development must be completed within this period.

Influence of the period of export and import

In fruit such as oranges which have a long ripening period if left on the tree in normal conditions, and of which there are varieties which, by their particular properties of rapid or slow development, enable growers to extend the period of cultivation to some six months or more, it is understandable that the possibility exists of choosing periods in which unfavourable external conditions make the risks of Ceratitis attacks very slight or non-existant. Thus, experience has shown that normally it is difficult to find adult flies between mid-December and the end of March in the orange-growing region of the Spanish Levant. Even if adults are found it is questionnable whether egg laying could be successful, as this requires a temperature of over 15 or 16°C. Normally there is seldom any risk of infestation of the very late varieties until May or June. The most dangerous period with regard to attacks is in Autumn, and even then there is fruit which remains free. In this paper the importance of the period of export in relation to the country has been emphasised and also the usefulness of visits from technicians of importing countries to zones where the produce is grown, where, in collaboration with the technicians of the exporting country, they can check the available information and can decide on periods and zones suitable for exports which would not present any danger to the importing country.

Dr.H.Piltz, Hamburg. (Original language: ENGLISH).

The sudden frost attack in the Winter before last caused much damage to the citrus cultures in the south European centres of cultivation. Therefore the European importing countries covered their requirements of oranges last season not only in the traditional supplying countries, but also in countries which were formerly of little importance. Larger quantities of citrus fruits from overseas countries were also made by reason of the efforts of the importers to provide the market with oranges all the year round. According to available information, deliveries of more than 1000 tons each from 14 countries in 1956 came into Germany through the port of Hamburg, i.e. (in order of importance) Spain, the United States of America, Israel, Italy, the Union of South Africa, Morocco, China, Greece, Mexico, Chile, the Lebanon, Brazil, Cyprus and Australia. Quantities of less than 1000 tons were delivered by Algeria, Turkey, Libya, Trinidad, Cuba and Egypt. A very small quantity came also from Paraguay. Argentine increased its citrus cultivation so that it was possible to import from there more oranges via Hamburg in the early Autumn of 1957 than during the whole of the previous season. On the whole, nearly 88,000 tons were imported from overseas, i.e. from countries which do not belong to Europe or the Mediterranean area (more than 55,000 tons from the American continent and its islands).

The increase in imports from overseas countries presented some problems for the plant protection organisation of the importing countries, two of which may be mentioned here:

1. In the New World the family Trypetidae (Fruit flies) is represented by the genus Anastrepha; according to Stone (1942) Anastrepha ludens, the Mexican fruit fly, is harmful to citrus and other cultures in Mexico, Central America up to Texas, while in South America, Anastrepha fraterculus is the most important pest of citrus fruits. There are 124 further Anastrepha species which only play a minor rôle in citrus cultivation. It is interesting that according to Henning (Sorauer Handbuch Vol.V,5th Edition) Ceratitis capitata occurs also in South America - I actually found both species in shipments from Brazil. If citrus consignments from overseas are infested by larvae it is necessary to identify the species or at least the genus. Certainly it is possible to distinguish the imagines of the two genera without difficulty. Anastrepha is much bigger than Ceratitis and the females have a much longer ovipositor; the larvae, however, can not be distinguished with the naked eye. Phillips (1946) was concerned with the identification of larvae; unfortunately I have only seen an abstract of this publication. Another study of the Mexican fruit fly by Baker, Stone, Plummer and McPhail (1944) also dealt with the morphology of the larva in detail. I was able to examine the larvae of the fruit flies from the Mediterranean region, Brazil, Mexico and the Union of South Africa in our import consignments. The back and the front spiracles of the third instar larvae are most suitable to make a diagnosis. The back spiracles are situated in couples on plates, i.e. there are 3 spiracles on each plate. The shape of the inter-spiracle setas

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is typical. They are situated in 4 groups on the spiracles or close to them. Hennig (1952) suggests that they serve to preserve the spiracles from becoming wet. We mark the spiracles the same way as Baker et al did in Fig.1. (*) and give numbers to the groups of setas in the same order of succession. In general the groups 1 and 4 are very similar to one another, while the other groups are less developed. Baker et al. found that the groups of setas vary in the same species with the habitat and the host plant. Figs. 3 - 10 are microphotos which show the interspiracle setas of Ceratitis from the Mediterranean region, i.e. from Israel. Characteristic are the number and the stiff shape of the setas. When I counted out the groups 1 and 4, I found at least 9, at the most 18, on the average 13 ends, counting on a ramification always the number of ends, not the number of the bases. Ceratitis, however, have a small number of branched setas. Mostly each seta has only 1, sometimes 2, seldom 3 ends. Anastrepha larvae from Brazil, however, have always many more ends (Figs. 11 - 16); I counted at least 26, at the most 44, on an average 36 ends per group. The individual setas are mostly branched like antlers. I found up to 11 ends per seta basis, but at least 2. In an orange consignment from Brazil were larvae, the interspiracle setas of which (Figs. 17 and 18) have on an average 13 ends per group. Mostly the setas were unbranched and had in individual cases at most 2 ends. No doubt this is Ceratitis and not Anastrepha; we were not able to hatch a fly from this shipment. The fruit flies from Mexico (Figs. 19 and 20) had 22 ends. That means this number was lower than that of the Brazilian fruit fly, but much higher than Ceratitis. The single setas were mostly branched, partly - e.g. the Brazilian fruit fly - like antlers. Further, it may be mentioned that larvae of Ceratitis capitata were found in consignments from the Union of South Africa which had the same shape as the forms from Israel; also another species was found, perhaps Ceratitis (Pterandrus) cosyra Walk. The material available, however, has not so far been sufficient to make exact examinations. To support the diagnosis one may employ - as mentioned above - the front spiracles. They are situated on both sides of the mouth hooks and show processes like buds, the number of which is important for determination (Fig.24). The picture shows the fore-end of Ceratitis capitata; we can easily distinguish 10 buds. On the next photograph (Fig.25) of Ceratitis we see also 9 or 10 buds. On every tested specimen I found at least 8, at most 11, on an average 10 buds. The Brazilian fruit fly has a greater number of buds. On this picture we count 14. The tested specimens had 12 and 16, on an average 13 to 14 processes. In comparison I demonstrate further the fore-end of some Ceratitis larvae found on Brazilian oranges (Fig.27) which show on an average 10 buds of spiracles just as the insects from Israel 9 to 11; this will be a good support for the diagnosis made on the interspiracle setas. The average number of buds for the Mexican fruit fly is 14.

2. Another problem, discussed before at the 2nd International Conference on the Mediterranean fruit fly in Bonn (September 1956) is the cooling treatment of infested fruits. During the discussion specially the members of the importing countries had the opinion that cooling treatment would be an extremely desirable destruction method because it is with certainty hygienic. We had the opportunity of testing fruits from

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(*) Refers to slides shown to participants in the Course.

different infested countries and paid most attention to the problem of cooling the fruit during transport. While fruit from the Mediterranean area is transported regularly in ordinary cargo steamers, for transport from overseas, mostly coolers are employed, specially when the fruit comes from the southern hemisphere, to prevent it from rotting during transport through the tropics. We ascertained the temperature in 83 coolers since August 1956:

39	ships	from the United States
14	"	" " Union of South Africa
10	"	" Brazil
8	"	" Mexico
7	"	" Argentina
4	"	" Australia
1	"	" Chile

The voyage lasted from

	days at least	days at most	weeks On an average
The United States	15	39	3 - 4
Union of S. Africa	15	35	3 - 4
Brazil	17	31	3
Mexico	13	31	3
Argentina	17	33	3 - 4
Australia	25	59	More than 3
Chile	39	41	More than 5

The cooling chamber temperatures generally varied from + 2° to +5°C for oranges, from 9° to 11°C for lemons; shipping oranges together with lemons the temperatures were about +10°C because of the sensitive lemons.

It is noteworthy that it was not possible to ascertain any stages alive of Ceratitis in any of the ships examined. In some cases, however, dead larvae, though few in numbers were found. Only in one case were we able to raise an imago of Ceratitis capitata from a larva in a cooler from South Africa, but this at a time when we were not yet interested in the temperatures.

We are not sure whether the freedom from infestation may be attributed to the cooling or whether the fruit is really free from infestation, since we did sometimes find dead stages, and at least it is known that the Union of South Africa, Australia, and with certain restrictions Brazil, Argentia and Florida are infested by Ceratitis.

The results of the examination correspond with the investigations by Back and Pemberton who carried out already in 1916 tests on the Hawaiian Islands. These tests are unsurpassed even today in respect of arrangement and quantity of material. Temperatures were applied for the cool storage which are of real practical importance. We find the following facts when we employ the results of these authors for our observations: Generally our ships are 3 weeks and more on the journey with temperatures of +2° and 5°C (for oranges). In the tests of Back and Pemberton all of the nearly 2000 third-stage larvae were dead after 18 days of treatment with cold of +2.5° to +4.5°C. The 2nd and 1st stage larvae proved to be more sensitive in another series of tests and the eggs were more

sensitive than the larvae. So it is demonstrated that practical experience corresponds with laboratory tests.

This, however, does not imply that the whole problem is solved. Fruit steamers sailing from the Mediterranean area to Hamburg sometimes take 1 week (from Spain), sometimes 2 weeks (from Israel). On the other hand it is necessary to have during a treatment of 14 days (according to Back and Pemberton) temperatures from 0° to +0.6°C to be sure that each stage of Ceratitis is killed. There is only data from Mason and McBride (1934) for a 1-week treatment which requires -2.5°C to kill 100%, -0.5°C to kill 99.7%. These temperatures, however, are too low for citrus fruits (as Frézal already mentioned in his paper in Bonn).

In conclusion, we may state that for a successful treatment with cold, a time of at least 3 weeks is necessary. According to Mason and McBride a further period of 18 to 48 hours will be required to reach the temperature in the inside of the fruits. Then it should be taken into account that - if I am well informed - fly populations from the Hawaiian Islands were employed for all published exact tests. The other investigations - e.g. in the Union of South Africa and in Australia - were carried out either with extremely low temperatures which practically hardly count at all for citrus fruits or only to get single results and information. But it might be possible that populations from other areas behave differently. It might even be possible that there are frost resistant strains or individuals. Therefore I take the liberty to suggest that every country suffering from the infestation by Mediterranean fruit fly should take up tests with the locally occurring populations; in consideration of the later evaluation it would be desirable to apply the method mentioned by Back and Pemberton. It would be much easier for the investigators to discuss with one another.

Finally, I like to inform you that - contrary to the Mediterranean fruit fly - living larvae of Anastrepha were able to survive in coolers. In a ship from Mexico sailing 44 days with temperatures from + 1.5° to 2.5°C, 8 live larvae were found, 3 of which developed to imagines which lived in the laboratory for 3 months. In another case 6 living larvae were found in a ship from Brazil which had been 20 days on the journey with temperatures of + 1.5°C. Three of these developed to imagines which remained alive for some time. In a third case two larvae from a Brazilian steamer pupated, but did not hatch. Finally, of 3 larvae alive from a Brazilian steamer, 1 imago lived for 3 months.

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H. Goffart, Munster. (Original language: GERMAN).

Generalities

Potato root eelworm is in the category of pests which give rise to phytosanitary regulations, i.e. imports of plants or parts of plants infested with the potato root eelworm are forbidden. There is scarcely any country today which does not protect itself against the introduction of this pest by appropriate regulations. Import restrictions are of course mainly in regard to ware and seed potatoes, but other plants and plant products which come in contact with the soil are also involved. The packing material must be above suspicion - many countries require potato packing material to be quite new. Some countries require more than a declaration that the consignment is free from infestation, and require assurance that the pest does not occur within a stated distance from the place of production - 5, 10 or 20 kms.

Alongside these sometimes rather restrictive measures, the question has been raised whether, since with a few rare exceptions, all countries of Europe are more or less heavily infested with the potato root eelworm, the utility of the phytosanitary certificate is not a thing of the past in regard to this pest, at any rate within Europe?

It should on the other hand be remembered that potato nematodes are far from being found everywhere, and are present only in certain parts of each country. We still have regions today in Federal Germany which are free of potato root eelworm, although intensive potato growing has been carried on for more than 30 years. Nevertheless, eelworm infestation disturbs the biological balance of the soil and can result in intensive potato production being impossible in some years. The fact that the eelworm can frequently be spread by being attached to potatoes when moved is also a reason for maintaining the regulations. The usual method of washing potatoes is insufficient to clear them of all cysts. Two washings under a powerful jet of water of at least 15-lbs. per sq. inch, with a 15-minute soak in water between the two washings will, according to Mabbott, free the tubers from the last remaining cysts. Experience in Federal Germany has, however, shown that such a method can easily result in retarded germination of the tubers and patchy vegetation, sometimes complete lack of vegetation, causing losses in yield.

In the case of potatoes for industrial purposes, the exporting country must also certify freedom from nematodes, because eelworm cysts might well be washed onto the surrounding land with the overflow water. The trade might misuse such special regulations by finding other usages for the potatoes after sorting.

The problem of the disposal of refuse containing cysts has not yet been satisfactorily solved - difficulties may arise, for example, when potatoes are transported from one place to another within a country. In that case the refuse is buried deeply, and in other cases nematicides are applied

/to

to destroy the cysts. Soil sterilisation may be used for small quantities of a few kgs. of soil, but absolute destruction of eelworms is never in any case guaranteed.

Soil surveys in Federal Germany

The soil samples are collected during the summer months, especially from land on which potatoes are being grown. On the contrary, during the Winter a preliminary examination is made, in agreement with the farmers, of fields which will be planted the following Spring in seed potatoes for export. The inspector responsible for the certification of the crop must also watch suspected patches and sometimes pull up a few roots. A final control is carried out before loading, when the potatoes are riddled. There seems therefore to be sufficient supervision. The fundamental procedure is doubtless the soil survey in the field. In order to obtain the best possible result, a uniform plan for soil sampling must be established in the fields to be sampled - the greater the number of samples, the greater the chance of finding foci of infestation, however small. According to the method in use in the Netherlands, now almost exclusively used in the Federal Republic, the samples are taken with a borer. At least 200 borings per hectare are necessary to reveal infestation in a field which would hitherto have passed unnoticed - this corresponds to one boring per 50 sq. metres. Fifty borings are equivalent to 250 gr. of soil, which is put into one bag. In a field where the rows are 60 cms apart, the person taking the samples goes right along one row in ten, making a boring every 8 metres, i.e. every 10 or 11 normal paces. Four combined samples per hectare are sufficient to give a general idea. If well applied, this method will regularly result in quite large eelworm populations being discovered. Small foci of infection, often of only a few square metres, can be missed in taking samples, and for that reason we now take 8 or even 16 combined samples per hectare for the preliminary examination of fields to be planted in potatoes in the current year or the year following. With this last method, one boring is taken every 12½ sq. metres. The greater the number of borings the greater, of course, the measure of security, but for both technical and financial reasons, the higher number can only be taken in very special cases. It is also considered that a man walking normally can take a boring every 3 small paces, lift the tool and empty the soil into a bag.

The bags are labelled on the spot and sent to the Plant Protection Service where they are numbered and placed in containers which are themselves placed in a drying chamber at a temperature of 35 to 40°C for 24 to 48 hours, to dry the soil. This operation is necessary because if not dried the cysts easily sink to the bottom of the water, thus slowing-up the inspection. Drying prolongs the examination time by about 2 days, but this is immaterial where seed potatoes, perhaps for export, are concerned, since the samples are taken in the fields in question months ahead, often before planting. If the time factor is important, as for example in the case of imports, undried soil samples can be examined, especially as it is unlikely that young cysts will be found, unless there are older cysts present, to detect which previous drying of the soil is not necessary.

After drying of the soil samples comes the operation of decanting the cysts in what are known as Fenwick cans. All

/particles

particles of earth which might contain cysts are suspended by a high-pressure jet of water. They reach the can, strike a metal plate placed crosswise, and are pushed upwards by the force of the water. They then pass into the neck which is inclined and has a spout and is placed two-thirds of the way up the can, and finally on to a 0.25mm sieve underneath the spout. All particles of 0.25 to 1 mm collect on this sieve, and any cysts underneath. The particles on the sieve and the cysts are next carefully washed onto a tray by means of a low-pressure jet of water, and examined.

The above-described method has been in operation in Federal Germany for several years, where potato growing is important and continually increasing. From the statistics in my possession, the number of samples examined in the years 1951-56 is as follows:

	Percentage for the principal potato growing areas in Schleswig-Holstein, Lower Saxony and Bavaria
1951. 1485 samples.	-
1952. 6250 "	-
1953.128600 "	83%
1954.225850 "	79%
1955.230525 "	76.5%
1956.About 226000 samples.	74%

The regional Plant Protection Service carrying out the greatest number of soil inspections is that of Ahlem, near Hanover. In 1956 it alone examined 108054 soil samples, and as each sample weighs 250 gr., 27 tons of soil were thus handled by this Station. In the year 1956-1957, the number of samples examined for Heterodera rostochiensis was 232760, representing 58 tons of soil.

For export consignments, a charge is made for the examination. For other lots no charge is usually made, but there are exceptions.

Recognition of potato root eelworm cysts

It is necessary for the inspector to be able to identify the eelworm cysts he finds. He must at least be able to distinguish the cysts of Heterodera rostochiensis from other species. Heterodera rostochiensis is the only species of which the cysts are found. In many cases it is thus possible to identify accurately by the shape of the cysts. Diagnosis is more difficult when the cysts are not fully developed - they are then pear-shaped and may be confused with H.punctata. In such an instance the cyst wall should first be examined; with H.rostochiensis there are several rows of dots, sometimes the rows are not continuous. They are horizontal on the neck, the central part and the posterior end of the body, i.e. perpendicular to the axis of the body, if the axis is taken as the head to the posterior extremity. However, recent examinations have shown that the dots are not always in rows. They can also be irregularly placed, as with other species of nematodes. When such difficulties arise, there is a third possibility consisting in the examination of the posterior extremity of the cyst. The female vulva can be identified with a microscope, and nearby the anus, definitely smaller, with convergent V-shaped

/grooves

grooves which are often quite clearly seen. Before full development is reached the vulva is spindle-shaped. Whilst the eggs are developing within the cyst, it swells and forms a fenestrate membrane. This fenestration is no longer present with older cysts, there merely being a round hole in that case. It is rarely necessary in practice to carry out such a detailed examination - time rarely permits; it is fortunately only necessary in exceptional cases when no other cysts are available.

Soil examination is the only method of finding all sources of infection in its early stages. It is of no importance whether the English or the Dutch method be used, as there is no essential difference between the two. The method should be made as widely known as possible and put into practice in all countries.

Dr. Ir. M. Oostenbrink, Wageningen. (Original language: ENGLISH).

Introduction

Potato sickness caused by the potato root eelworm, Heterodera rostochiensis Woll., is characterised by its insidious appearance, its perseverance in the soil and the difficulties to find a rational method of control. Research workers and plant protection authorities give it special attention since it threatens the intensive culture of potatoes, a crop of primary economical and social importance in many countries. The direct and indirect damage in infested regions with an intensive growing of potatoes is considerable.

The symptoms of the disease are not very specific. The only sure characteristic is the presence of cysts on the roots of the potato plant or in the soil. In the case of local infections distinctly confined patches occur after some years; more evenly distributed infections may cause a sudden failure of crops on whole fields. In all cases the disease returns the next year and spreads when potato culture is continued in the same way. More or less distinctly confined foci may be present in certain districts in the beginning. Heavily attacked plants remain small and lank and give little or no harvest. The tubers from an infected crop are usable notwithstanding the fact that they bore cysts. The quality may be low.

Biology of the nematode

The life cycle of the nematode will be shown diagrammatically. An important feature is the formation of resistant cysts and the special behaviour of the inactive larvae. As many as 749 larvae have been found in the inactive cyst in the soil. Most of them become active under the influence of root excretions of growing host plants. Cultivated host plants, which are susceptible to injury, are potato and other tuber-forming Solanum species, tomato and eggplant. The Solanaceae comprise some other wild host plants, but they are not weeds of importance. Even under a host crop part of the larvae are left in the cyst; on the other hand free larvae are present in the soil under a non-host plant or under fallow. Data on the presence or absence of a winter diapause according to different workers, are conflicting. Soil temperatures above 20 °C are unfavourable for the activity of the eelworms. They can evidently thrive in all soils where potatoes are grown. Active locomotion of the larvae does not exceed a few decimeters. After penetration of the larvae 4 moults occur. Males are abundant and fertilisation appears to be essential. 6 - 10 weeks after planting, white, and subsequently yellow and brown cysts are visible with the naked eye on roots, tubers and other subterranean parts of the potato. Reproduction seems to be mainly due to one generation, since few larvae of newly developed cysts are found to infest the plant immediately. At some localities strains are found which attack the newly-bred potato varieties resistant to the common eelworm strain. There may therefore be biotypes which behave differently in other respects as well, though no pertinent data are available up to now.

/There

There is no doubt about the rôle of the eelworm as the primary agent of the disease, from inoculation experiments and circumstantial evidence. The disease symptoms comprise the starvation and the drying up of the plant as the result of the root infection. The mechanism is not fully explained. The formation of "giant cells" in the phloem, food withdrawal by the eelworms, mechanical damage to the root, secondary invaders as well as toxins by the eelworms and secondary invaders may play a rôle.

The cysts of potato root eelworm are as a rule easily recognisable from other species. This fact, together with their size, their flotation potencies and the density of the population opened the possibility for the application of soil sample examination as a routine-work in control activities.

Resistance of larvae within cysts

Larvae within cysts are well-protected against adverse factors in the soil. Great resistance is noticed against moisture, dryness, high and low temperature and chemicals. A considerable proportion of the larvae in the cysts were alive after immersion in water for 15 months, and after dry storage in a bottle for 5 years. The larvae in dry cysts were not killed at 56°C for 24 hours (whereas moist cysts did not stand up to 10° lower for 1 hour). Potato root eelworm can stand high doses of most pesticides, but the larvae within the cysts are susceptible to nematicides at about the same rate as other nematodes.

The foregoing data account for the easy spread of potato root eelworm by means of transplants and other carriers, and reject the application of infested refuse as a fertiliser unless it has passed a sufficiently high temperature in the compost heap. Each ml of infested soil may contain a cyst, and also a single cyst normally gives rise to infection and multiplication when it reaches a growing host plant.

Reproduction rate in the case of continual potato growing

During the period of incubation of the disease (the time between infection and the occurrence of symptoms of the disease) the number of eelworms on each potato crop is found to increase about ten-fold. As soon as the soil contains ½ to 1 cyst per cm^3 (that is about a milliard per ha) the symptoms of potato sickness appear and the tolerance of the plant becomes the limiting factor for the multiplication of the eelworms. Data of laboratory experiments and checked field cases are available. They illustrate the insidious character of potato sickness; normal infections prove to have an incubation period of several years and will normally give rise to other infections during that period.

Disease symptoms occur at densities of 250,000 - 2,500,000 larvae per potato plant. A potato crop appears to mobilise the greater part of the nematodes present. The number of newly developed cysts per potato plant ranges up to 50,000 per plant, except when the crop collapses completely, thus depriving the eelworms of their possibility of reproduction. At this level the endurance of the potato crop mainly determines the number of newly formed cysts. Each crop replaces nearly the whole viable nematode potential and it is therefore the last-grown crop which determines mainly the actual level of

infestation. In successive years the nematode density and the disease symptoms often fluctuate alternately within certain limits.

The same holds for the culture of tomatoes, though the endurance of this crop and the final population level of the nematodes are lower than with the potato. Alternate culture of potato and tomato in infested soil is especially fatal for the last-mentioned crop.

Regression of the population under non-host crops

When non-susceptible crops are grown it appears that the number of viable cysts and larvae decreases on an average about 50% each year, while on the other hand we know that even after 10 - 16 years a small percentage of living larvae are still present within the cysts. Empty cysts seem to be present in the soil in a recognisable state about 8 years more. Data are available on a number of fields in which the populations have been examined periodically since 1941.

The choice of non-susceptible crops does not seem to have much influence on "cleaning" the soil, nor does the application of organic manures or the different methods of tillage of the soil. The disappearance of the nematodes follows a biological mortality curve and incidental observations indicate that the activity of epiparasites plays a rôle in this process, thus stressing the theoretical possibility of biological control.

Destruction of infested crop or refuse will not be practical, except as a prevention of new infections. The main source of the eelworm potential is the infested soil and the total decrease will hardly be influenced by the destruction of a part of the population. Even soil disinfection with fumigants or steam does not give full sterilisation, but it may reduce the "cleaning" period by a few years.

Dynamics of the eelworm population under the influence of crop rotations and other effective interferences

Data from long-term field trials illustrate the great effect of crop rotation on the eelworm population in the soil and the result of this on the yield of the potato crop. Under influence of the host plant the otherwise stable eelworm population proves to be highly dynamic. There is a strict relation between degree of soil infestation and the intensity of disease symptoms.

When comparing different potato crops the incidental influence of year, soil, manuring and treatment also become clear. In moderately infested soil an interval of 2 or 3 years between successive potato crops appeared to be sufficient to minimise the risk of noticeable crop losses. In practice "ground creepers" often appear to upset seriously the favourable effect of rotations. Cases are available where 2 years between successive main crops of potato have prevented the building up of a detectable eelworm population notwithstanding initial infections; in the same field and under the same circumstances monoculture of potatoes and one crop in two years have already raised the population and caused the disease for several years.

There does not seem to be much difference between the present potato varieties with respect to population dynamics of

the eelworm, but early digging appears to be a potential factor in suppressing the nematode population.

The resistant potato varieties, bred from crossing with certain Solanum andigenum varieties, appear to suppress the population even more efficiently than non-hosts, in spite of the fact that a small number of cysts may mature on the roots. They seem to be, however, generally susceptible to damage of the penetrating larvae and the first crop in infested soil may therefore suffer considerable damage.

Soil disinfection with modern nematicides may kill 90 - 99% of the larvae, but its efficiency is threatened by the high costs entailed by the rapid increase of the remaining eelworms. With a tenfold multiplication a mortality of 90% will be neutralised by one main potato crop and 99% by two successive crops.

Conclusion

The data on the rate of reproduction and death of the eelworms and the dynamics of the infestation level result in a mathematical concept of potato sickness, which can be presented diagrammatically. It gives an insight into the nature of the disease, and illustrates the effect of different inoculations, the spread of the disease, the appearance of symptoms and the possibilities and limits of rotations and other treatments for averting the disease and of soil examinations for locating it. These data bear upon the situation in a moderate climate and with the growth of susceptible potatoes. Different climatic conditions and the culture of more resistant potato varieties may influence the picture.

J.Bruneteau, Bordeaux. (Original language: FRENCH).

Nursery stock requires very careful inspection both in the plantation and at the time of despatch.

If inspection is carried out in the nursery in the Summer months, unhealthy plants can readily be detected by the appearance of the vegetation.

Commercial requirements, however, necessitate a further inspection at the time of despatch, which takes place in the Winter. Inspectors must therefore know the various characteristics of dangerous pests in order to detect them and make the necessary decisions.

This paper will thus be a brief review of the most important arthropoda and diseases, including an outline of control measures.

I. VINE NURSERIES

Mites. Adults or eggs may be found of species such as Metatetranychus ulmi, Eotetranychus carpini,etc. The eggs are spherical and reddish in colour. They are found in varying quantity in the folds of buds or under split bark.

Scales. On young vines, scales such as Eulecanium corni Bché or Pulvinaria vitis may be found. Fumagine is generally observed at the same time.

Phylloxera. On the roots of European vines, nodules may be observed and phylloxerous tuberosities, sometimes complicated by necrosis.

Inter-nodial stunting. The causes of the stunted vegetation should be sought.

2. FRUIT TREE NURSERIES

On young fruit trees may be found eggs (of mites or insects), scales or pathological lesions.

Eggs. The eggs of mites are generally laid underneath the buds or at the axil of branches. They are spherical, not exceeding 0.1mm in diameter. Attention is drawn to them through their colour. The foliage of plants attacked by mites becomes leaden in appearance by reason of the infiltration of air into the disintegrated cells. This leaden appearance could not be confused with the loosening of the parenchym provoked by a disturbance of the water balance following dry periods in a sandy soil.

The eggs of Lepidoptera are more easily seen. They appear under the skin of buds (Winter moth), in rings around the twigs (Malacosoma), in groups ressembling a small faun-coloured sponge (L.dispar) etc.

/Aphis

Aphis eggs are generally black and shiny and are laid in varying numbers at the ends of the branches, in the folds of buds or at the axil.

The woolly aphis (Eriosoma lanigerum Hausm.) is accompanied by white waxy filaments. It is seen at the root neck of young apple trees or in the swellings which it causes on the wood.

Scales. Scales either of the sub-family Lecaniinae (Lecanium corni Bché and L.persicae F.) or of the Diaspinae may be observed. In the latter group the San José scale (Quadraspidiotus perniciosus Comst.) is of special importance. The shield of San José scale is ash grey, more or less blackish, and slightly raised in the centre. Underneath the insect is dark lemon yellow with the pygidial end slightly browned. It could not be confused with Epidiaspis leperii Sign. of which the follicle is greyish with a red centre, and the female wine red. But it could be confused with Quadraspidiotus pyri Licht., Q.ostreaeformis Curtis or Q.zonatus Frauenf. of which species the females are also lemon yellow, although lighter. The shield of Q.pyri is dark grey, with the larval moult dome-shaped, and darker. Q.ostreaeformis ressembles Q.pyri by its follicle and the appearance of the female. Q.zonatus has a larger follicle which is slate coloured, and this species is practically confined to the oak and the beech.

Q. perniciosus causes a purplish-red patch on the bark to which it is fixed, which colours the subjacent tissues rather deeply. When there is heavy infestation, a large part of the sapwood is thus mordanted with red.

Method of examination. Microscopic examination is essential for accurate identification. In Winter it is the immature female which is found, but sometimes besides this larval form, dead adult females are found under their carapace.

For immediate examination, the living insects are extracted from their follicle and they are fixed in 80° alcohol. The females are immersed for 10 minutes in a drop of lactic acid. They are then mounted between a slide and cover either in Faure liquid or in Amann lactophenol.

Faure liquid. 50 gr. chloral hydrate are dissolved cold in 50cc of distilled water, and 20cc of glycerine are stirred in. 30 gr. of gum arabic are suspended in this liquid in a piece of muslin. Complete dissolution takes several days. This medium clarifies the scales after some time - thus avoiding putting specimens which will not be examined for 3 or 4 days in lactic acid.

Lactophenol. This is an excellent liquid for examining both scales and plant tissues. It is made by mixing 10 gr. pure crystallizable carbolic acid, 10 gr. lactic acid, 20 gr. glycerine and 10 cc. distilled water. The liquid is kept in a yellow flask to avoid discolouration by the light.

Scales mounted in these media can be recuperated for final mounting in Canada balsam.

If dead or dry forms are being prepared, they are put immediately into lactic acid, or even directly into the examination liquid. It is often necessary to colour the insects before embedding them, for certain structural details and especially to show up the vulval opening. Magenta red is used for this, after passing through alcohol. Any excess of colour is removed with alcohol, on the slide itself.

Characteristics of San José scale. One of the characteristics of the female of the adult Q.perniciosus is the absence of perivulval glands, whilst the other Diaspinae in question always have such glands. It should be noted, however, that in the genus Aspidiotus these glands do not exist in the larval stages. It is therefore necessary to be sure of the stage of the scale before being examined, only the adult possessing an apparent vulva on the ventral face of the pygidium.

The most marked characteristic of the second larval stage is the shape of the lobes and exterior pectinae.

The San José scale has two pairs of lobes notched in the centre of their outside edge, this notching being well marked on the medians. On the other Diaspinae mentioned, there are three pairs of lobes, the third developed in varying degree. With Q.ostreaeformis, the notching of the median lobe can give it a somewhat trilobate appearance. It should also be noted that in this species the outer pectinae are narrower without notched extremities.

Lastly, another characteristic of San José scale is its apparent viviparity - the eggs hatch in the body of the female, or at the moment of expulsion.

Damage by insects. In fruit tree orchards established on new ground, incisions made by Ceresa bubalus F. (Buffalo tree hopper) are found, the scars left by the ovipositor of the female have the shape of finger nail impressions. They cannot be confused with hail marks - here the point of impact is on the upper surface of the oblique or horizontal twigs. Further, hail damage is often accompanied by laceration of the bark.

On young pear trees damage is to be seen caused by the larvae of Agrilus sinuatus. This is in the form of winding tracks underneath the bark which is raised and may be the seat of cankers.

We would mention Zeuzera attacks - these bore a rising track in the young wood - and attacks in young peach shoots caused by the caterpillars of Anarsia lineatella Zell. or Laspeyresia molesta Busk.

Withering. It is necessary to seek for the causes of withering in the nurseries - it may be due to a disease, or underground insect attacks, or climatic conditions. Extreme cold, for instance, takes its toll sooner or later. Following spring frosts, ring-shaped injuries may be seen at ground level which can in the long run cause the death of the tree. Prolonged sunshine causes

splitting of the bark - almost always on the West or South-West side.

Damage by disease. Nectria galligena causes a canker on pome fruit trees. It often has the appearance of a livid depression around which the cankered swellings develop. The perithecium is bright red and easily visible in the Autumn and Winter. It cannot be confused with cankers caused by scab on pears which look more like crevasses in the skin.

Diaporthe perniciosa March. causes on plum trees bark necrosis which wrinkles and becomes cankerous. The pycnidia produce reddish-yellow tendrils. Notice the swellings which develop at the root neck of many kinds of tree and which are caused by Bacterium tumefasciens Smith & Towns. Crown gall is a disease of the parenchyma which is revealed by cankerous nodules at the root neck or on the wood and can also cause abnormal growth of the fine root fibres.

3. FOREST TREE NURSERIES

Wood-boring pests. Young poplars can be mined by borers (Saperda carcharius L.) and the entrance to the track is indicated by the debris and excrement of the insects.

The Aspen borer (S.populnea L.) attacks branches of thumb thickness. Its presence is observed by the characteristic swelling which it causes on the stem.

Sesia apiformis makes a track in the lower part of the plant. Its point of entry is marked by wood dust or the empty chrysalis.

Young cypress trees can be killed by attacks of Phloeosinus beetles following on weakening of the tree by excessive cold or heat on sandy soil.

Damage by disease. Young chestnusts can be destroyed by Ink Disease (Phytophthora cambivora) in heavy wet soil already infected. It is important to distinguish this disease from that which causes chestnut blight (Endothia parasitica). This fungus provokes a breaking out of tissues and the hypertrophy of the upper part of the lesions, which are more or less reddish on young wood with yellow-orange fructifications.

The poplar can be attacked by Dothichiza populnea, which forms necrotic spots on the bark with black pycnids.

On conifers, note vesiculose rust of Weymouth pine, which causes cankerous growth with split bark sweating resin. Large-scale infection of poplars in the USA can certainly be traced to nursery stock of European origin.

We would also mention the disease of the needles of the Douglas fir caused by Rhabdocline pseudotsugae Syd. which discolours the tips of the needles and turns them brown in Winter.

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Finally, plantings can be affected by diseases such as Pythium or Phytophthora omnivora. Such attacks are the most frequent in very dense nurseries on damp soil.

Methods of phytopathological examination

The recognition of certain damage caused by disease is often difficult by its very nature, and especially if saprophytic fungi (Valsa etc.) are present in addition to the causal agent. In such cases samples are taken in the stroma or the organs of fructification. They are soaked for some time in 70° alcohol to remove air bubbles and soften the tissues. Sections are then made which are coloured with a drop of cotton blue, which is heated until the first vapour appears. Any excess of colour is removed with alcohol and it is mounted straight away in Amann lactophenol.

Some samples need to be left in a damp cell for the development of the fructifications or for the appearance of an unadulterated mycelium, or even to be transferred to a culture medium. In any case, as many different aspects of the symptoms of damage as possible should be removed, and the fragments examined while they are fresh.

4. PHYTOSANITARY MEASURES

In this paper, limited to the main pests, the variety of their symptoms has been shown.

Some are frequent and generally spread. These are defoliating or underground pests: mites, aphis, xylophagous insects. They are none the less harmful - they weaken and depreciate plants. They necessitate systematic treatments. The inspector must advise on methods and suitable dates: insecticidal or fungicidal mixtures, either in the Winter or during seasonal activity.

Other pests cannot be eliminated without continued attention and special measures. These are, for example, bacterial or fungal cankers and scales, both Lecaniinae and Diaspinae. Their presence demands severe treatment in order to ensure eradication - field disinfection, destruction of contaminated plants, protection and placing in quarantine of neighbouring plants, control of commercial transactions.

Disinfection of plants in the nurseries themselves is done under tents by specialised teams. HCN is used at 2.5 gr. per cubic metre in the Winter - double that dose for San José scale during the period of vegetation. The time of application is 30 to 45 minutes.

The inspector must be ruthless for cankerous plants or any with suspect damage. These must be destroyed at the nursery. Even if the number of affected plants is small, neighbouring plants must be watched with special care and under no circumstances must they be moved. If necessary administrative steps can be taken to establish contaminated zones, where all trading in stock is prohibited, and protective zones surrounding them.

But whatever their origin, consignments are inspected. The consignees of lots from affected nurseries

are traced and the plantations from the suspected trees are watched.

Even if the examination does not reveal the presence of any pest, it is wise to treat the plants, at least by soaking in an oil emulsion with added parathion, and a fungicide - e.g. an organic copper compound.

The best guarantee against scales is disinfection under tarpaulin as already stated, or in a fumigation chamber, or, better still, in partial vacuum. This is, moreover, a requirement of some importing countries.

Under partial vacuum HCN is generally used at 3gr/cu.m. for 45 minutes. Some deciduous plants can be treated with methyl bromide in the winter at 30 gr/cu.m. for 2 hours.

On the other hand, conifers and vines cannot be treated with this gas, but it is suitable in any case for the disinfection of packing material.

I have given briefly some essential points concerning inspection of nurseries from the technical, administrative and repressive points of view.

It would be impossible to be too strict in measures to eliminate dangerous pests, because the health condition of the orchards or forest plantations, which is so important when the trees are young, depends on the work of inspection of nursery stock.

G. Peeters, Belgium. (Original language: FRENCH).

1. INTRODUCTION

All countries now recognise the usefulness and importance of international cooperation in order to prevent the introduction and spread of pests and diseases. On the other hand, they realise the necessity of interfering as little as possible with international trade in plants and plant products.

International Conventions. There are two: the International Plant Protection Convention (Rome, December 1951), and the Convention establishing the European and Mediterranean Plant Protection Organisation (Paris, April 1951). The Governments adhering to these Conventions have accepted specific obligations in regard to common and effective action to avoid the introduction and spread of plant pests and diseases:-

(a) obligations on Governments to take legal, technical and regulatory measures

- for the official plant protection organisation;
- for the nation-wide dissemination of information on plant diseases and pests and their methods of prevention and control;
- for research and experimental work in plant protection.

(b) obligations on the plant protection services, to ensure the strict carrying out of the measures prescribed by their Governments and of agreements reached with other countries.

Essential responsibilities of plant protection services.

- inspection of growing crops, of cultivated areas (fields, plantations, nurseries and glasshouses) and of plants and plant products in store or in transport, to detect the existence and spread of pests and diseases and be able to carry out control measures.
- Inspection of consignments of plants and plant products intended for export, including where necessary articles or products which might act as carriers of the pests and diseases.
- Disinfestation or disinfection of plants intended for export, as well as of the vehicles of transport.
- Delivery of the necessary phytosanitary certificates, certifying the condition and place of origin of the produce.

Conclusion: The responsibilities of plant protection services under the international conventions are clearly

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established and defined. They have a mission of trust vis-à-vis the foreign countries. The services of exporting countries must conscientiously carry out the responsibilities which have been undertaken, and give all the guarantees required by the countries of import.

Carrying out the responsibilities in the international framework.

1. In the framework of the international conventions already mentioned, the term "plants" comprises living plants and parts of plants, including seeds where a Government deems this to be necessary.

2. The phytosanitary requirements may also apply, where Governments consider it necessary, to storehouses, means of transport, receptacles, packing materials or any other materials accompanying produce, such as soil, which occur in the international transportation of plants and plant products.

3. Cultivated land comprises fields, plantations, nurseries and glasshouses.

4. The plant diseases and pests particularly aimed at are those which are of special importance from the standpoint of international trade and are immediately or potentially dangerous.

In practice, the regulations made by the different countries determine

- the pests and diseases against which they wish to protect themselves,

- the plants or plant products liable to such attacks.

Special problems require special attention or solution (e.g. fumigation).

Note: The inspection of plants intended for propagation or multiplication needs to be carried out with special care.

2. THE ORGANISATION OF INSPECTION OF NURSERY STOCK IN BELGIUM

A rational organisation must include two kinds of control: first, inspection of the growing crops; second, inspection of the produce intended for export.

Field inspection. It is important that this should be done by experienced technicians, with a sound knowledge not only of the pests and diseases of the crops, but with methods of cultivation. These specialists must know - and be able to recognise - the plant pests and diseases which exist in their country or those whose introduction may be feared. They must also know the species and varieties most susceptible to attack by the pests or diseases, in order to be able to recognise them easily and adjust their observations during the inspection.

In Belgium the inspection of growing crops is carried out only by inspectors of the plant protection service, who all have university degrees (ingénieurs agronomes) and have been appointed after an examination covering the various

aspects of phytopathology in its widest sense, and horticultural technique.

Legal foundation of inspection

(a) By a Royal Decree of March 26, 1936, all owners or occupiers of land who keep or cultivate, under glass or otherwise, horticultural crops, nursery stock, or other produce specified by the Minister of Agriculture, must allow such land to be visited by officials of the Plant Protection Service at any time between sunrise and sunset. All those who store or transport such produce may be visited at any time.

(b) The Plant Protection Service has the widest powers to keep under control pests and diseases. It can issue specific instructions as to lifting, pulling up, growing, harvesting, storing, destroying, or any other measures considered necessary for stamping out harmful pests or diseases. It can apply such measures for the establishment of protective zones. It can prohibit the transportation of produce from infested territories.

Methods of execution

All horticultural undertakings and all nurseries, whether concerned with fruit trees, forest trees or ornamental plants, which produce material for export, are subject to the control of the Plant Protection Service and are rigidly inspected at least twice a year. After each visit, the inspector records on an "inspection card" the results of his visit under one of the headings "in order" or "not in order", with his signature and the date of the inspection.

Conditions required to enable a holding to be certified "in order".

(a) The holding and all crops must be free from plant pests and diseases deemed to be dangerous: these are set out in a list established by the Plant Protection Service in agreement with the Plant Pathology Commission - a consultative body responsible for the over-all supervision of the health of crops in Belgium. In compiling the list special account was taken on the one hand of the pests and diseases which receive special attention by EPPO, and on the other hand of those included in the phytosanitary regulations of countries importing Belgian produce.

(b) The holding must also have the phytosanitary and other characteristics of a well-kept holding. In other words, pests and diseases which are usually widespread in the country, as well as weeds, must have been kept down to the minimum.

(c) The holding must conform with all the "internal" phytosanitary regulations. For example, potatoes and tomatoes may not be grown in horticultural establishments and nurseries growing plants for export. Harmful thistles must be absent.

A certificate "in order" is usually valid for a period of six months after the inspection. In special cases more frequent inspections may be carried out.

Holdings which are "not in order". Owners or occupiers of holdings "not in order" may ask for another inspection to be carried out (at their own expense) after they have conformed with the instructions of the Plant Protection Service.

Refusal or withdrawal of inspection certificates. An inspection certificate is refused or withdrawn when only a part of the crops on the holding is shown to the inspector, or when the latter is not given the help necessary to enable him to make the investigations required.

General picture of the sanitary condition of nurseries and horticultural crops. In view of the importance of the inspection of crops - which will affect the subsequent inspection of consignments for export and the issue of phytosanitary certificates - the inspectors concerned must:

(a) keep a list of the holdings under their supervision, with the numbers of the certificates issued, the dates of the inspections and the results;

(b) send the results of their inspections weekly to the headquarters of the Plant Protection Service, which can thus follow the work closely and record the position on a special chart.

Additional comments.

(a) When an inspection reveals the presence of a new or dangerous pest or disease, the Ministry of Agriculture must be informed by telegram, so that steps to deal with it may be taken immediately.

(b) In doubtful cases, or where the inspector cannot himself identify the cause of damage, specimens of the affected plants, insects, etc. are sent for diagnosis to one of the specialised laboratories in phytopathology or entomology.

(c) In cases where one person or firm farms more than one holding, each holding must be inspected and be given an inspection certificate.

(d) To avoid abuse, horticulturists and nursery owners are strictly forbidden to mention in their advertisements, catalogues, letter headings, etc. that their holdings are under the supervision of the Government Plant Protection Service.

(e) This work of the phytosanitary inspection of nurseries and horticultural crops is a long job, but it is indispensable.

Advantages of crop inspection. Apart from the necessity of knowing the sanitary state of horticultural crops and nurseries in order to decide what steps should be taken, inspection has several other important advantages:

(a) It is a valuable means of keeping the producers up-to-date on plant protection matters: nature of the diseases, importance of losses, method of spread, remedies to employ, etc.

(b) It keeps the Plant Protection Service informed of the kind of produce on the holding and the relative importance of the crops. Thus the grower is prevented from submitting produce which has not been grown on the holding.

(c) The sanitary history of imported produce can be followed up (quarantine).

(d) Inspection of crops during the growing period is indispensable for the detection of viroses.

(e) The health of consignments for export can be supervised more rapidly and effectively.

Detection of potato root eelworm. Crop inspection also enables soil samples to be taken for the detection of potato root eelworm. The technique is as follows:

- each plot of land is carefully and systematically sampled. On each area of one-third hectare, a soil sample is taken of about 300 gr. (enough to fill the plastic container) by 60 borings made over the whole of the plot. All plots surrounding the holding are similarly sampled.

Inspection of consignments for export.

- Legal foundation

No consignment of horticultural plants, nursery stock or other produce specified by the Minister of Agriculture can be sent abroad, unless it comes from a district recognised by the Plant Protection Service as free from plant pests and diseases.

In practice, phytosanitary certificates relating to produce for export can only be obtained by nurseries or horticultural holdings possessing an "in order" inspection certificate. The phytosanitary certificates, however, are only given for produce which equally conforms with the requirements of the importing countries.

Finally, consignments are only allowed to be exported, or to be transported with a view to export, if they are accompanied by a phytosanitary certificate based on:

- the inspection of the growing crops;

- the sanitary condition of the produce;

- the sanitary state of the district of origin of the produce.

Applications for phytosanitary certificates. Requests for the inspection of consignments and for certificates are made in writing on a special form provided for horticulturists and nurserymen. They must indicate the country of destination, the nature (kind) and quantity (number) of the produce to be exported, and the place where the produce has been grown. These requests must be sent to the inspector of the region at least one working day in advance, and a duplicate must be sent to the headquarters of the Service.

This procedure enables the inspection work to be rationalised; any special conditions imposed by the importing

country to be verified; the determination, by reference to the special chart, that the holding has an "in order" inspection card; and the control of the exact origin of the produce.

Conditions on which certificates may be obtained. To obtain a certificate, the consignment must:

- conform with the standards fixed by the Belgian regulations;
- be in good general state (healthy, genuine and saleable produce);
- conform with any special requirements of the importing country.

Fulfilment of conditions laid down by an importing country. Each inspector is provided with a handbook giving for each country:

- the names of the products whose importation is forbidden;
- restrictions on importation (periods, special authorisation, etc);
- the products for which a phytosanitary certificate is required;
- pests and diseases which should be specially looked for;
- where necessary, the "distance requirements" imposed;
- any special requirements as to packing material;
- any additional declaration required, etc.etc.

The handbook has become still more necessary since the widespread adoption of the phytosanitary certificate recommended by the International Plant Protection Convention, 1951, which no longer details the particular conditions imposed by the importing country.

Special cases.

(a) Export consignments of produce not all of which has been grown by the sender. Before issuing a certificate, the inspector finds out the exact source of the produce (for example, by examining the invoices for the parts of it purchased) to make sure that all the consignment has come from holdings in receipt of an "in order" inspection card. This happens when an exporter applies for certificates for produce which he does not normally grow on his holding or for quantities in excess of his own production. Only plants which were on a holding on the occasion of the most recent inspection are considered as coming from a holding in possession of an "in order" inspection card.

(b) Occasional consignments. In exceptional cases, which must be justified on each occasion, the Head of the Plant Protection Service is authorised on his own responsibility to waive the rules relating to crop inspection, but he must always conform with the requirements of the importing

country. (Consignments exported by private individuals).

Refusal of phytosanitary certificates. A certificate is refused:

(a) for products coming from a holding which was not found "in order" when the crops were inspected;

(b) when the whole consignment does not conform with the conditions of the importing country;

(c) when the sender has knowingly misled the inspection service;

(d) when the produce has come from a region from which exportation is not allowed (distance requirements). These regions are fixed by the headquarters of the Plant Protection Service on the basis of its own investigations and of information on the general health condition of crops supplied regularly by the "ingénieurs agronomes", the "ingénieurs horticoles" and their assistants stationed throughout the country.

Methods of execution. The inspection of consignments is made much easier when the growing crops have been adequately inspected in advance. The inspector must scrupulously conform with the text of the international certificate which he signs and issues. This sets out the method of procedure for it states:

"This is to certify that the plants, parts of plants or plant products described below or representative samples of them were thoroughly examined on (date).....
by (name).....an authorised officer
of the (Service).....
and were found to the best of his knowledge to be substantially free from injurious diseases and pests; and that the consignment is believed to conform with the current phytosanitary regulations of the importing country....."

EPPO, which is organising this International Refresher Course, when studying this subject, has drawn up the following recommendations:

"A code for the sampling of consignments of plants for propagation cannot be rigidly laid down, as circumstances and products vary very widely, but as a rule an inspector should see at least 3% of the consignment and in some cases of doubt 5% or more. As far as possible he should take samples from different bags, crates or bundles".

In Belgium, inspection of nursery stock and horticultural plants is more intensive than the minima proposed above. In practice it takes place at the premises of the consignor when the consignments for export are being assembled and examined before packing.

To stop a less scrupulous exporter from changing or adding plants after the inspection, test checking of random samples takes place at any point from the packing centre to the frontier station or port of export.

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In view of the perishable nature of the produce, inspections must be carried out in the shortest possible time.

3. QUALITIES NEEDED BY PLANT PROTECTION INSPECTORS

Article V 1(a) of the International Plant Protection Convention (Rome, December 1951) states:

" Inspection shall be carried out and certificates issued only by or under the authority of technically qualified and duly authorised officers and in such circumstances and with such knowledge and information available to those officers that the authorities of importing countries may accept such certificates with confidence as dependable documents".

This stipulation shows that the carrying out of the control of exported produce is work of the highest importance. It is extremely delicate and requires much intelligence and initiative.

A good inspector must clearly possess all the technical qualifications needed for the inspection of both growing crops and of consignments for export. He must also have many "moral" qualities, and in particular must be strictly conscientious, in view of the position of trust he holds vis-à-vis the foreign countries. He must be a keen observer, and his knowledge must be reinforced with good sense. To carry out his work properly, he must also have a close knowledge of the nurserymen, producers and exporters in his district.

In practice, the inspector who knows his job and his "clients" will give special attention to exporters whom he knows to be less careful; he will scrutinise more carefully those varieties of plant most susceptible to certain ailments, while resistant varieties can be more quickly dealt with.

The supervision of the work of the inspectors by the Plant Protection Service, far from weakening their authority, gives support to their actions, and is a demonstration to the nurserymen of the importance of phytosanitary control. In this respect, a very favourable atmosphere has developed in Belgium during the last few years.

4. CONCLUSIONS

EPPO has put its hand to the task of creating between countries an atmosphere of mutual confidence, which must facilitate the international trade in plants and plant products. The organisation of this International Refresher Course for phytosanitary inspectors is a new proof of this. It is up to the different plant protection services and their officers:

(a) to respect faithfully their engagements, by honestly applying the measures laid down, so as to prevent the spread of dangerous pests and diseases;

(b) to convince the nurserymen, producers and exporters that they are the first to benefit from the steps that are taken, that it is in their own interest to give loyal support to the carrying out of plant protection measures,

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and that in addition the buyers have the right to receive healthy and irreproachable products.

When a country imposes reasonable (*) and clearly-formulated conditions relating to its imports, the plant protection service of the exporting country is under an obligation to ensure that exported consignments are sent out in a good state of health and accompanied by phytosanitary certificates of genuine value. To this end, it is necessary to ensure:

(a) strict supervision of the growing crops (pre-control of crops);

(b) thorough inspection of consignments for export;

(c) general supervision of the producing areas, to prevent the spread of pests and diseases.

Inspectors must (a) have an intimate knowledge of their districts - the crops, their health condition, the products to be controlled, the nurserymen and other producers of crops for export; (b) be up-to-date concerning the phytosanitary regulations of the importing countries.

These few practical indications are based on the efforts made in Belgium to improve the efficiency and output of phytosanitary control, and in this way to satisfy as far as possible the requirements of foreign countries.

(*). To require, for example, 100% freedom of plants from all pests - including such an ordinary and widespread pest as the common aphid - would not be reasonable.

Dr. G. Bestagno, San Remo, Italy. (Original language: FRENCH).

For reasons of climate, all cut flowers exported from Italy come from western Liguria, especially from the region of Imperia. Carnations are the main flower crop, then come roses, and to a lesser extent chrysanthemums, broom, mimosa, anemones, Ranunculus, gladioli, narcissi, strelitzia, euphorbia, decorative plants, etc.

In the short time at my disposal I cannot speak of all the pests and diseases against which flower crops must be continually protected; in any case most of them have no particular interest so far as export of cut flowers is concerned, as their presence would prevent the actual production of the flowers. I would mention, however, that some of them, and some diseases not yet introduced into Italy, are often a cause of concern when we, in turn, import flower bulbs and cuttings (rooted or not) of special carnation productions. Where the diseases are not detected during the inspection of a consignment at the frontier, owing to the infestation being in the latent stage, it is impossible, owing to the perishable nature of the goods, to find the time necessary to guarantee freedom from disease, and we must rely on the vigilant control which can only be carried out on the growing crops by the plant protection service of the exporting country.

In this paper I will describe the methods of inspection of cut flowers for export to countries requiring freedom from San José Scale (Quadraspidiotus perniciosus Comst.) and Carnation tortrix (Cacoecia (=Tortrix) pronubana Hüb).

So far as San José scale is concerned, I willingly emphasise that I have nothing to say on this subject, for fortunately neither now nor in the past has it been found in flower crops with woody stems grown in Liguria, such as roses, mimosa, broom, prunus, eucalyptus, etc.

As to Carnation tortrix, which in recent years has caused some concern to Ligurian flower-growing, I will mention certain points of a biological nature, indispensable for the recognition of infested flowers. I shall also give some further information, for the inspection of consignments for export is only the last stage of operations which include an intensive and methodical control of the growing flower crops and a most careful selection on the part of both the producer and the exporter. Further, I shall mention the difficulties of giving an absolute guarantee of immunity from the pest, and I will refer briefly to investigations designed to find a method of mass disinfection of consignments before export.

Some points on the biology of carnation tortrix and the recognition of infested flowers

Tortrix pronubana is polyphagous, but has a special preference for the carnation: hence its name, Carnation tortrix.

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On the Ligurian Riviera it has four generations: the first from mid-March to mid-June; the second from mid-May to the end of July; the third from mid-July to mid-September; the fourth from early September to the middle of March in the following year. It hibernates in the larval stage, from eggs laid on the stems and leaves during Autumn.

The "staggered" emergence of adults of the last generation of the preceding year means that apart from the Winter period (December - February) when only larvae are found, all stages of the pest - eggs, larvae, pupae and adults - can be found at the same time during Spring, Summer and Autumn.

The young larvae attack the leaves during the first few days of their life, living as burrowing insects (miners); they then leave the "galleries" they have made in the leaves, and migrate towards the stem. The leaves are stuck together with sticky masses of silky threads, within which the larvae make their home, feeding on the tenderest tissues of the leaves themselves. The detection of infested stems and leaves is very easy, for the signs of feeding, the presence of silky threads, and the withered and deformed growth, show at a glance the presence of the passing of the larva. The larvae also attack the flowers, feeding on the claw of the petal, and the flower buds, where they feed on the interior. Penetration of the flowers takes place in different ways: - in the flower bud, more or less advanced, the larva can enter by the base across the stem by means of a short gallery, or by the apex, or at the side by a small perforation; - in the opened flower, near cutting time, the attack can take place where the sepals fan out, or by perforating the "limb" of the petals, or even in the stem.

The detection of infested young buds is easy, for they cease to develop and wither; the holes are also clearly evident from the presence of the silky fringe. In the case of flowers more or less open, detection (short of crushing the flowers) sometimes presents difficulties, especially if the infestation is recent. In that case the only sign of the larva visible on the flower or on the stem immediately below the calyx is the single minute hole of entry or weak feeding marks on the edge of the petals; these can often escape detection because of the normal shape of the flower; further, if penetration has occurred at the point of separation of the sepals, the traces are imperceptible.

On the other hand, in cases of older infestation, the petals of infested flowers show a network of silky threads which prevents them from opening properly.

Control of carnation tortrix and legislation

The health condition of the flower crops is the direct responsibility of the Plant Protection Observatory at San Remo, under the Plant Protection Service of the Ministry of Agriculture and Forestry. This Observatory is responsible for the technical direction of control measures against Carnation tortrix; control is compulsory by virtue of a Ministerial Decree of June 30, 1952, the Government in particularly necessary cases distributing control products free to the growers. The Decree, inter alia, makes it compulsory to destroy by fire each year all previous-year flower crops remaining on June 15th.

These provisions have had the result that the control of this dangerous pest is now carried out on a rational and unified plan and with control measures found to be effective after careful research.

The control has as its foundation spraying the crops at 10-day intervals from June to November, and again from the following March, with insecticides with a base of synthetic organic compounds (DDT, Lindane, Endrin), with added phosphoric esters (Parathion). These treatments, if efficiently carried out, will keep the crops free of Tortrix, with not more than 0.1% infestation. The results allow consignments for export to be guaranteed healthy at the time they are submitted for inspection.

Methods of inspection of flowers

Inspection is carried out in the stores of the exporters where consignments arrive after having been first selected by the producers. The exporters make a second selection and prepare the flowers - as required by the Ministry's regulations - by taking off the "slips" and flower buds, if this has not already been done by the producers. The flowers, prepared in this way, are placed on benches, grouped according to the quantities in each package, and the plant protection inspector examines a sample of 25% of the consignment; if he finds it free from Tortrix, he issues the phytosanitary certificate. If he finds one or two larvae, he demands a second selection and examines another lot of samples, but such a concession would not be given to a grower who habitually presented infested consignments.

Clearly such control cannot by itself constitute an absolute guarantee of immunity, because only a sample of the produce is inspected. Practical difficulties must be admitted, owing to the fact that the interval between the purchase of the crop in the market, its preparation and its despatch, must necessarily be very short during periods of heavy foreign demands, when the selection of the flowers carried out by the exporter cannot be completely satisfactory. There is also the difficulty referred to above of very recent attack by the pest.

However, if some caterpillars escape our inspection, I ask my foreign colleagues not to attribute this to want of good will or to negligence on the part of the control itself.

With the object of eliminating even such difficulties as are described above, laboratory experiments have been carried out at the San Remo Plant Protection Observatory, to find out the possibilities of gas fumigation of bulked consignments already packed and ready for despatch. Fumigation has been carried out both in vacuo (American and French method) and in artificial atmosphere (Gasconserv method), the gas used being methyl bromide. Total destruction of larvae has been achieved, even with the severe limits imposed by the sensitivity of the flowers to the gas; in other words, even at low concentrations and short exposure periods.

However, inasmuch as the concentrations with which positive results have been obtained represent the minimum for obtaining total larval destruction and the maximum permitted to avoid the risk of harming the flowers, it would seem that the

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use of gas fumigation is not immediately practicable, and that it will be necessary to carry out further research into the subject.

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Dr.J.W.Hes, Wageningen. (Original language: ENGLISH).

Whenever plant stock has to be exported and the country of destination requires an accompanying health certificate, the stock concerned is liable to inspection by an authorised official.

Inspection carried out at the moment of despatch is no longer considered adequate by many countries, since it will then have become impossible to establish the absence of various diseases, notably those diseases of which the symptoms can only be ascertained on the growing plants.

Following inspection for export the official may issue a health certificate which - at any rate in its international form - mainly indicates:

(1) that the stock submitted for inspection, or a representative sample of it, has been duly examined and,

(2) to the best of his knowledge,

(3) has been found to be substantially free

(4) from injurious diseases and pests, and furthermore,

(5) that he believes the consignment to conform with the phytosanitary regulations of the importing country.

To deal with these points at any length would call for much more time than is available. We shall therefore have to restrict ourselves to a discussion on flower bulbs, going somewhat further only into point 4.

This "to the best of his knowledge" is a matter of constant concern to directors of phytosanitary services and chief inspectors. It is their duty to see to it that their inspectors shall be, and continue to be, fully abreast with current methods of preventing dangerous diseases and pests, and with methods of examination as carried out in practice. Adequate preliminary training of inspectors is obviously of the greatest importance, but at the same time they should be continually kept posted on any new diseases and pests discovered by scientific workers in the phytosanitary field which are of international importance. If legitimate complaints are received from abroad on the condition of any stock certified for despatch, it is often being discovered too late that a given inspector is wanting in knowledge or industry. It is for this reason that the operations of inspectors should be constantly and closely supervised in order to be able to take action at once whenever this should prove necessary. This close supervision is moreover also necessary with a view to ensuring that all inspectors shall apply the same standards of judgment. It goes without saying that this is not only important within the scope of any given country. I have inferred that the present Course should be looked upon as a natural consequence of the policy pursued by EPPO to provide inspectors - on an international level - with the means of acquiring a fuller knowledge of the various diseases and inspection methods, and to arrive at comparable

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working methods.

Examination of a complete consignment will only be feasible if it is not too large. As a general rule, however, the examination will be restricted to inspection of the samples taken. The drawing of samples which shall be representative of the entire consignment is, in our opinion, not the most tricky problem. The size of the sample as well as the manner of testing used must mainly depend on the type of stock under inspection. Plain common sense should be the deciding factor in such a case. Nobody would be so foolish as to require that all bulbs should be cut in two for the purpose of inspection, as this would obviously be tantamount to destroying the consignment. In spite of this it will in many cases prove necessary to cut through a considerable portion of the bulbs in order to be able to duly establish the absence of a given anomaly. If later on, in the country of destination, the consignment should, in spite of this, appear to be affected, if only to a minor extent, it is obvious that the officer concerned can not be seriously blamed. He has, in issuing a certificate, been merely wishing to indicate that the consignment in question was "substantially" free of disease or of pests. This may, dependent on the nature of the consignment (consumption article or seedlings) be interpreted in various ways. It will be clear that nobody can be blamed if, among a parcel of 1,000 narcissus bulbs, no more than a single bulb is found to be affected by the large narcissus fly. This is on the other hand certainly the case if in a similar parcel some 100 of the larvae of the insect are found.

The inspector declares that he believes the consignment is capable of meeting the phytosanitary regulations of the importing country. He can only do so provided these regulations are known to him. It is therefore necessary that the heads of phytosanitary services keep their inspectors duly posted on these regulations, and inform them of any modifications of which they should be aware. This should not constitute a problem, provided these regulations be duly made known by the country concerned. Present-day practice with most countries is to make phytosanitary regulations available, either via the medium of EPPO, or through personal contacts, or via diplomatic representatives. However, anybody regularly dealing with these matters may know that the data of some countries, if indeed there are any data at all, are very hard to lay hands on. Nevertheless, this state of affairs is bound to improve as more countries become members of EPPO, and it is probable that the establishment of similar organisations in other parts of the world will contribute to a solution of these problems.

The inspector certifies the consignment to be free from any injurious disease and pests. Now what exactly is to be understood by injurious disease and pests? This point obviously requires some further elucidation as may well be illustrated by a few examples with reference to the hyacinth.

It would seem to us that the danger entailed by any given disease will be largely dependent on the destination of the bulbs, or, in other words, on the expectations cherished by the receiver. Examples: a grower is wanting to plant bulbs, multiply them and sell the surplus crops; a nurseryman is wanting to plant bulbs, either in hothouses or in the open, harvest the flowers and sell them; a private person having planted the bulbs in a pot or in his garden, is expecting

well-shaped flowers, to be looked at with pleasure. The finest bulbs, obtained from a healthy stock, having been subjected to the right type of processing in sheds, well-cared for and stored, planted at the most propitious moment and grown under optimum conditions, are to be considered the ideal prerequisites calculated to satisfy any user.

As for the forwarding and packing of approved bulbs, inspectors may make suggestions which may be helpful in ensuring that the bulbs will arrive in good condition, Anyone may know from practical experience that the wrong type of treatment may be a cause of complete failure, and also that frequently one is quick to mention "disease" as the cause of the trouble. To outsiders this must in most cases sound plausible enough, since there will always be evidence of moulds, insects or other organisms on any type of vegetable matter in decay. Mention in this connection should be made of two frequently occurring types of infestation, i.e. the bulb mite Rhizoglyphus echinopus Fum.& Rob. and Penicillium glaucum Link.

The bulb mite is of general occurrence. Anyone dealing with flower bulbs knows this mite and has been able to establish for himself that it constitutes a fairly harmless pest. The mite only settles on the bulb in the presence of decaying tissue, and has little chance of doing any harm to the healthy bulb. It is consequently advisable to prevent damage to the bulbs as much as possible.

Penicillium glaucum is probably the most widely distributed mould in the world, becoming rampant wherever organic material is stored in damp, poorly ventilated spaces. Bulbs kept under such conditions are especially liable to attack by this mould. A first requirement is to see to it that the bulbs are stored in a dry place. The mould also frequently occurs on bulbs subjected to the conditions entailed by longer or shorter transport, in spite of the fact that the bulbs may have been perfectly dry on being packed. The explanation of this phenomenon is that the metabolic products of this live material also include water. In view of this the bulbs should be efficiently packed, using dry packing material capable of absorbing moisture. Moreover, the space in which the bulbs are to be conveyed should be capable of being ventilated. Sound material, though expertly despatched, is however liable to be inadequately stored on arrival, so that mould formation, among other things, may yet occur. It might be asked what is the actual damage done by Penicillium? The answer is: on the whole nil, even though the bulbs admittedly become unsightly as a result. If the bulbs are, however, stored in inadequately ventilated space, some damage is not to be entirely excluded.

As an example of a genuinely noxious disease should be mentioned yellow disease, causative agent Xanthomonas hyacinthi (Wakk.)Dowson. This bacterial disease, formerly the terror of hyacinth growers, can today no longer be said to constitute a real cause of danger to cultivation, though it is of fairly frequent occurrence. Bulbs affected by this disease generally do not come up. If they do, their leaves are a darker green than normal, whilst they also soon start drooping. To prevent contamination the affected bulbs should be dug up and destroyed. In the event of plants in the vicinity being already affected, which becomes apparent from darkish bands occurring on the foliage, frequently alongside the edges of the leaves, these plants should be killed by the use of 10% formaline spray, which

will effectively check further spread of the disease.

In the case of recently lifted hyacinth bulbs, it will be hard to ascertain whether the parcel is actually infected with the disease. This can only be achieved after the plants have been thoroughly dried at a suitable temperature. Near the extreme ends of the leafy scales, yellow, slightly raised,spots occur. These spots extend downwards across the outer surface of the scales as irregular bands. In this way the bacteria reach the bottom of the bulb. Only after the spots have slightly expanded and have assumed a distinctly yellow colour, can they be detected by cutting a slice off the top of the bulb. This slice should not be too thin, for then the section may not include all scales, but not too thick either, as in that case one will remain clear of the yellow spots, which may not yet have tended downwards far enough.

Should a given parcel be to some extent affected with yellow disease, it should be condemned. If in a large sample one only comes across a few isolated diseased bulbs, the entire parcel must be tested in the ascribed manner and any affected bulbs removed. This method of inspection is called "visitation" much in the sense as also assigned to it by Customs officers.

The infection of the bulb eats itself into its core until the bulb is finally completely destroyed. On this process a method of control is based, indicated by the name "hot processing". To this end the bulbs are first stored for a considerable period (about a month) at a temperature of 30.5°C. At this temperature the bacteria will multiply at a fast rate causing the destruction of any affected bulb. Next the bulbs are stored for another month at 35 to 37.5°C, a temperature which will kill the bacteria. This method, which has been devised by Prof. Van Slogteren, has achieved excellent results in practice.

Dr. G. Schumacher, Bonn. (Original language: GERMAN).

Every year cut flowers, ornamental plants and flower bulbs to the value of many millions of German marks are imported (mainly from Belgium, France, Italy and the Netherlands) into the Federal German Republic, where they are processed or grown on numerous horticultural holdings. Some of these commodities soon leave the holdings again as they are destined for immediate use or for planting in private gardens. On the other hand, the quantity of flower bulbs used for propagation on German territory, mainly in North Rhine and E.Friesland, is continually increasing. In these regions the acreage used for this purpose is extended every year, as conditions have been found to be favourable for the purpose.

In view of the fact that such large quantities of goods are being imported and that their use is so diverse, there is a real risk of the introduction of pests and diseases and of the contamination of holdings. Careful and conscientious import inspection is therefore justified as even in the best export inspection it is not possible to examine all bulbs, cut flowers and plants in such a way that a guarantee of absolute freedom from disease of all consignments could be given.

In addition, it has to be borne in mind that inspection upon export becomes even more difficult if typical symptoms of a disease develop only during storage, or, as may well happen, only during transport. The former possibility applies mainly in the case of flower bulbs which are often packed and stored a long time before they are actually marketed. With azaleas, on the other hand, the transport in warm and humid waggons is sometimes enough to give rise to the typical galls caused by Exobasidium japonicum. These aspects have to be taken into consideration in order to explain the cases in which in recent years produce had sometimes to be refused.

I will first of all discuss procedure in the inspection of cut flowers. This material being highly susceptible, it has to be handled and examined with the greatest care. Most important amongst herbaceous cut flowers are carnations, which have to be inspected whatever the country of origin. In practice looking for the presence of the carnation tortrix moth (Tortrix pronubana) is the only criterium; for goods coming from Austria, Czechoslovakia, Greece, Hungary, Roumania, USSR and Yugoslavia, inspection also includes Hyphantria cunea. In practice inspection for both can be done simultaneously.

Importation of carnations from all countries is now permitted into Germany throughout the year. This relaxation naturally results in an increased risk of introduction of the pest from countries where it exists. This has to be taken into consideration upon import. For instance, in the case of import from northern countries or Belgium, the Netherlands, etc., it might be supposed that a random sample would show that the consignment is free; however, when southern countries are concerned, and especially Italy, inspection has to be far

more thorough. In these cases it would hardly be sufficient to examine 5% of the produce, even if this implies that consignments might occasionally be held up. Tortrix pronubana has been placed in Group I, which means that if it is found, even if only a single specimen, the whole consignment has to be refused. Control of this pest is technically possible and practically feasible in all countries. Therefore it is justifiable to require that control be carried out properly at least in those holdings which have a real interest in export. The growing of carnations in Germany having been extended enormously in recent years, the introduction of a new pest which so far has not become established, must be avoided at all costs in order to safeguard the interests of the industry, in which many small holdings are now engaged.

For the same reasons the Chrysanthemum midge was included in the new phytosanitary regulations. For all chrysanthemums inspection is now compulsory and rooted plants may not be imported between April 16 and September 30. Only for Belgium, Denmark, Finland, Great Britain and Northern Ireland, Ireland, Iceland, Luxembourg, the Netherlands, Norway, Poland and Sweden has the time restriction been waived and importation is permitted throughout the year. Inspection is aimed at tracing the presence of the chrysanthemum midge (Diarthronomya chrysanthemi) which is easily revealed by the presence on leaves, stems and petals of 1 - 2 mm greyish-green hairy cells. They are found in a slanting position on the surface.

Bacterial wilt of begonias (Xanthomonas begoniae) has to be considered upon the import of young plants, as this disease, once it has attacked a crop, might at best be limited, but never again completely eradicated. For this reason consignments including plants showing the typical symptoms should definitely be excluded from importation.

Cut flowers from herbaceous plants other than those above-mentioned and coming from all countries are permitted entry throughout the year, but in the case of Austria, Czechoslovakia, Greece, Hungary, Roumania, the USSR and Yugoslavia, where Hyphantria cunea is assumed to exist, consignments must be examined and importation is restricted to certain customs stations. From other countries no certificate or inspection is required, and there are no restrictions as to customs stations.

As in the case of carnations, the import of cut flowers of lignifying plants is also no longer limited to certain periods; import from all countries throughout the year is now possible. Inspection is carried out with regard to Hyphantria cunea and to San José scale. The same principles apply as in the case of carnations, viz. inspection of consignments from countries where the pests are known to exist must be very careful. Here again consignments can be refused if only one specimen is found, and, in the case of San José scale, even if this one specimen is dead. The risk of these pests being introduced with cut flowers is an extremely serious one. It should not be forgotten that the produce is taken to the consumer as quickly as possible. From there it is often transferred to the compost heap and in that way is brought into the smaller and very small private gardens. In these

the Plant Protection Service is not in a position to check regularly or only starts to do so when it is rather too late to isolate the pocket of infestation. For this reason between April 16 and September 30 cut flowers of woody plants have to be fumigated if they come from countries other than Belgium, Denmark, Finland, Great Britain & Northern Ireland, Ireland, Iceland, Luxembourg, the Netherlands or Sweden.

The next point is the inspection of azaleas, which are imported from Belgium in large quantities. Not only from Belgium but also from the other countries listed above, azaleas can be imported throughout the year. From countries not listed, imports are only accepted between October 1 and April 15, whereas from Japan, Canada and the U.S.A., any import is totally prohibited. In general the produce is imported in what is called an "unprocessed" or a "semi-processed" condition. In the former case it has to be grown for another 6 to 12 months or more in specialised holdings in Germany before being marketed; in the latter it is just a matter of forcing, that is of bringing the produce into flower. Legislation now in force requires that the plants be free from Japanese beetle (Popillia japonica), Azalea tortrix moth (Acalla schalleriana), Azalea leaf miner (Gracilaria azaleella), Azalea galls (Exobasidium azaleae) and Ovulinia wilt disease and of Septoria leaf scorch. Of the pests mentioned only the Japanese beetle, not so far observed in the Federal Republic, has been classified under No.I. The other pests cannot be said not to occur in Germany. Nevertheless their absence from imported produce must be required as they can cause considerable loss. Therefore no reason exists to change the existing legislation. The same applies to fungal diseases for which, however, Ovulinia wilt has been added to the list. In recent years Azalea galls were most conspicuous in imported consignments and in most cases it was due to this disease when difficulties with regard to import arose. It is probable that the disease is far more widespread than is generally thought; growers might conceal its presence by picking off affected leaves before despatch but this procedure does not eradicate the disease. During transport the respiration of the plants generates warmth which, together with humidity, is favourable for the development of new fructifications and spores of the fungus through which the disease spreads. Diseased plants can easily be traced during inspection. In making a decision the destination of produce should be taken into careful consideration and the possibility of granting an exceptional import licence if infestation is only from 1 - 2% should always be applied if the consignee only intends to force the plants into flower; in the case of consignees who simultaneously propagate azaleas themselves, more rigorous standards should be applied.

With other diseases, especially Septoria and Ovulinia, this procedure is not to be recommended. Here rigid rules must be applied and no exceptions are permissible. It is of no importance whether the plants will be forced and sold immediately or whether they will be further propagated. In both cases heavy losses to the consignee might result. The case of azalea diseases is a good example which shows that phytosanitary regulations are not just rules to be automatically applied, but that occasionally exceptions are justifiable which can be included in the legislation concerned.

For roses which are imported to be planted or propagated, it is required that they be free from diseases, inter alia virus diseases. Here difficulties arise. Other diseases are rather easily detectable but virus diseases cannot be traced during frontier inspection. In my opinion there is no other solution but to confirm the freedom from virus by a subsequent inspection during the period of vegetation following. The additional inspection does not present an extra difficulty, as during the period of vegetation the nurseries have in any case to be examined for attacks by virus or pests. These inspections are also necessary for the export of German produce.

With regard to the inspection of flower bulbs, phytosanitary regulations are now more satisfactorily adapted to the real circumstances. First of all the ubiquitous root mites and penicillium fungi have been deleted from the quarantine list. Even if inspectors at the frontier are sometimes confronted with a consignment so heavily infested with mites or attacked by penicillium as to be practically worthless, even then it is primarily a matter of depreciation of commercial value, and any importer is capable of handling it, or at least should be.

I must emphasise again that it is the task of the Plant Protection Services to prevent the introduction of pests and diseases, but not to stop the importation of poor quality produce, which is a matter for the individual who purchased it. On the other hand some bad cases occurred during recent years necessitating the addition of some fungal and bacterial diseases to the quarantine list. This applies specially to gladioli and freesia. Hitherto gladioli had only to be inspected with regard to gladiolus thrips (Taeniothrips gladioli). Scab and neck rot (Pseudomonas marginata) has now been included in the list, as consignments received from abroad, of which some have been very heavily infected, actually present a danger to the propagation carried out in Germany. The same applies to Fusarium wilt (Fusarium oxysporum Schlecht.f.gladioli), Sclerotinia dry rot (Sclerotinia gladioli) and Septoria hard rot (Septoria gladioli). Those diseases show clear symptoms and frontier inspection can be carried out without any damage to the produce. In the case of narcissi it was also felt desirable to extend the list of diseases to be looked for by including basal rot (Fusarium bulbigenum) as the quantity of imported diseased bulbs became so large that a real danger existed. The risk of infestation of crops by the large and the lesser narcissus flies (Lampetia equestris; Eumerus strigatus and E.tuberculatus) has, on the contrary, decreased. Treatment of flower bulbs by submersion for 10 to 30 minutes in Aldrin, Dieldrin or Heptachlor solutions containing 150 to 200 g. of active ingredient per 100 litres of water gives good control of these pests which formerly could not be checked at all. Consequently occasional infestation should not be a reason to refuse consignments. On the other hand it cannot be expected that produce of which 5% of even 20% is attacked be permitted entry.

No changes have been made with regard to tulips and hyacinthis, apart from the relaxations mentioned earlier. The diseases and pests under consideration are especially stem nematodes (Ditylenchus dipsaci), Sclerotium disease (Sclerotium tuliparum) and botrytis in tulips and hyacinths and black slime disease (Sclerotinia bulborum) and yellow slime disease (Xanthomonas hyacinthi) in hyacinths. All these when introduced into a holding always result in a contamination of the crops

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which lasts for several years. Therefore strict rules are necessary. Usually the long crop rotation which would be required to be effective cannot be carried out for practical reasons. Therefore eradication of diseased plants is the best means of control.

I hope to have given a clear picture of the fundamental new principles governing the importation of flowers and flower bulbs into the Federal Republic. I am well aware that experts in several other countries do not always share our point of view. I must, however, stress the fact that the restrictions embodied in this Decree are to the greatest possible extent based on the way in which the pests and diseases concerned really occur in crops in Germany. In adapting the regulations to prevailing circumstances the biological aspects have been taken into consideration. The Decree therefore exclusively serves phytosanitary purposes.